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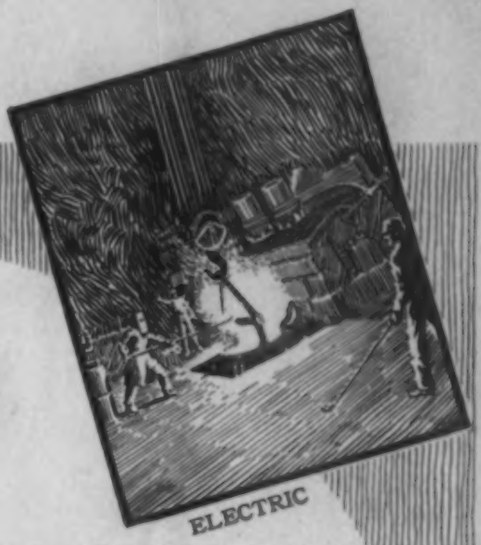
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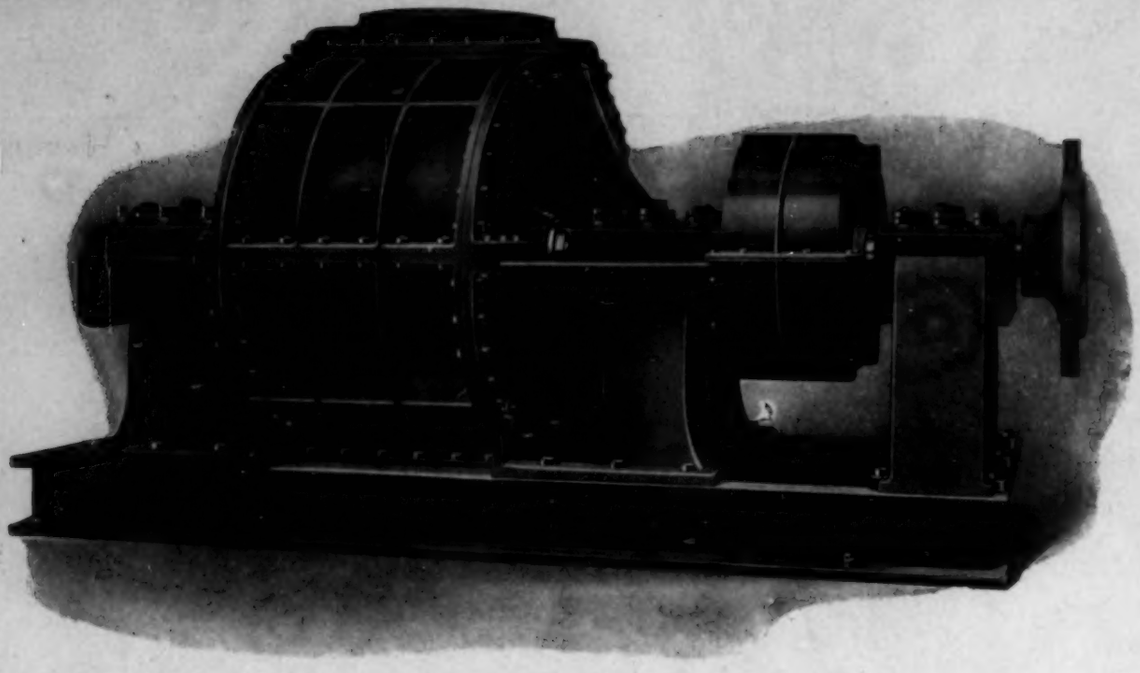

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THE IRON TRADE REVIEW

Vol. LIX Cleveland, November 16, 1916 No. 20

Mills Withdraw from the Market

Are Not Willing to Pile Up Orders With Uncertainty as to Delivery—Prices of Rails and Pipe Advanced

THE great strength of present conditions is shown by the action of some companies in declining to take on additional orders and in others booking business in an extremely conservative manner. One of the largest independent companies has announced that it will not take any orders for shapes, plates, bars, tin plate or wire products until further notice. The same policy has been followed by nearly all sheet manufacturers, partly because of the very active demand and partly on account of the scarcity of sheet bars and uncertainty as to their prices for future delivery.

The placing of additional orders for shell steel is expected at an early date. The steelmakers have offered to supply more than 1,000,000 tons for the last half of next year and if the belligerent countries follow the policy pursued in the past, all of this tonnage will be taken.

Plates

The demand for plates continues at an astonishing rate. One company received in its mail for a single day inquiries for 42,000 tons for various deliveries extended through the first quarter of 1918 to all classes of buyers, principally ship and car builders. A Canadian merchant who has been inquiring for large tonnages for export is now in the market for 14,000 tons urgently requested for early delivery. The trend of plate prices continues upward.

Pig Iron

Belated buyers of pig iron are having their troubles. This is shown particularly in eastern territory, where important consumers who delayed making purchases now find themselves unprotected for a large part of their requirements for next year and are making an earnest effort to cover, but are not finding it easy to do so. One buyer of this class is trying to place orders for from 25,000 to 50,000 tons for any delivery next year. Pending inquiry in New York territory is estimated at 200,000 tons. In the Pittsburgh district, prices of pig iron continue to advance and as high as $30, valley, has been paid for bessemer for shipment in the first quarter of next year. This is an advance of over $6 since the latter part of October. Dealers in basic are asking $27, valley, but no sales above $25 have been reported. Very heavy sales of low phosphorus pig iron have been made in the east for delivery in the last half of next year. In Buffalo, the situation is extremely strong, with furnaces sold far ahead, one company having disposed of its product for all of next year and another up to the last quarter of next year.

Coke

Foundry coke for prompt delivery is commanding some extraordinary prices, as high as $10 having been paid in the central west, while in New England, where an embargo, ordered by the New Haven railroad, has been an important factor, as high as $15 has been paid.

Price Advances

The expected advance of $5 per ton on steel rails for 1918 delivery has been announced, making the price $38 for bessemer and $40 for open-hearth steel rails. It is understood that these new prices also will apply to any new orders for earlier than 1918 delivery, which necessarily would be for late next year, if at all, as mills are sold up until then. Heavy inquiries for delivery year after next have been pending, not only from domestic, but from foreign sources, and it is expected that large tonnages will now be placed. Prices of standard steel and wrought iron pipe have been advanced 1 point, or about $2 per ton. Cast iron pipe has been advanced $5 per ton at New York, $3 at Chicago and $1 at Birmingham. Scrap prices are higher at leading centers.

Car Shortage

The car shortage is serious. It, together with the shortage of labor, is responsible for the rapid advance in the quotations on coke for prompt delivery and it is retarding both incoming and outgoing shipments from many blast furnaces and steel plants. Foundries also are suffering.

THE OPEN HEARTH

The Tariff Commission—Let Business Men Speak

WOODROW WILSON, in a speech made during the recent campaign, declared that he did not care a peppercorn for the result of the election, but that he was anxious to have the approval of historians who write in future years. If he serves as president until March 4, 1921, he will be the only man since Ulysses S. Grant to serve eight consecutive years. Regardless of what may be said about his administration up to date, he still has an opportunity to fill a highly honorable and exalted position in the history of the country. Many problems confront him, but these problems are also opportunities for great service. This is particularly true at the present time in the case of the tariff. Opinions differ widely as to what will happen after the war. The report of Joseph G. Butler Jr. on conditions in the iron and steel industry in France, published in *The Iron Trade Review* of Nov. 2, furnished new evidence of the determination of the entente allies to act in harmony in commercial matters after the war is ended. Mr. Butler found that steel manufacturers in France are determined that after military victory has been achieved and France has again entered into possession of her own, there will be a close union with the British producers which will prevent a rapid return of German industrial prosperity.

"With this fact in mind," said Mr. Butler, "it seems clear to me that the United States will have to make up its mind in which field it will choose to work. It certainly will be impossible to continue to hold a position of theoretical neutrality."

In other words, the United States must be prepared to deal in a give and take spirit and extend favors to those nations which are willing to do the same to it. Whether the policy of reciprocity advocated by William McKinley in his last speech delivered at Buffalo, a few hours before he was shot by an assassin, will be revived in form, we do not know, but it ought to prevail in spirit. We think Americans generally will be agreed on this point and that they will also agree that they do not know even approximately what tariff schedules should be adopted in order to insure ample protection for American industries, and at the same time provide for fair dealing for those nations which are willing to deal with the United States on a just basis. It is certain that a thorough investigation to ascertain the facts as to cost of production will be necessary, and congress has paved the way for such an investigation by creating a tariff commission. The President promised to appoint this tariff commission before the presidential election, but failed to do so, and we are not disposed to criticize him for this failure, for he must have found it extremely difficult to get the right kind of men to serve on the commission when they did not know whether their tenure of office would extend beyond March 4, next, or not. Now, however, when it is known, or will be known at a very early date, that the tenure of office of the commission will extend for at least four years, it ought not to be difficult to obtain men of high character and ability to serve their country on this commission. If the President will appoint men especially qualified for this work, regardless of their views as to protection and free trade—men who will not allow their personal views to interfere with the thoroughness of their research for facts—a long step will be taken toward removing the tariff from politics. A properly constituted commission would, we believe, receive the hearty co-operation of manufacturers generally, and facts would be disclosed as never before.

Facts ascertained as the result of thorough, nonpartisan investigation and presented in an intelligent manner will have tremendous effect on tariff legislation and we believe that many members of congress would be willing to put aside theories held in past years and legislate in accordance with the best interests of the country. We are authoritatively informed that recently a man very close to the President made this statement:

"In view of present worldwide conditions, we are not disposed to foist any economic theory upon the country, but will be governed by the results of the investigations of the tariff commission."

Hence we believe it will be worth while to do all that can be done to have the right kind of men appointed to the commission.

The business men of the country should make themselves heard on this subject. They should give the President distinctly to understand that they are not working for any particular individual or individuals, but are very much in earnest in urging him to appoint to this commission men who know something about manufacturing, not psychologists, or professors, or other kinds of theorists without practical knowledge. If the President should call upon men of large affairs to sacrifice their private interests and serve on this commission, they should do so. Such service would not be less patriotic than that of the soldier who volunteers to battle for his country's flag.

Write to the President, write to your congressman and urge the appointment of practical business men to membership on the tariff commission. Do it today, for the commission is likely to be appointed soon.

THE OPEN HEARTH

Closing the "Infernal Gulf" Between Capital and Labor

AN ENCOURAGING sign of the times is the fact that vital questions relating to employer and employe are receiving constant attention from representatives of both capital and labor. The speech of Cameron C. Smith, president of the Union Steel Casting Co., Pittsburgh, at the recent meeting of the American Iron and Steel Institute in St. Louis, impressed everyone, for it disclosed a keen appreciation of the necessity of bringing about better conditions. Mr. Smith referred to the old feelings of hostility which existed among competitors, now happily replaced by feelings of confidence and friendship, and he declared that the next great step must be to bridge the "infernal gulf" between capital and labor. Getting down to fundamentals, the real trouble in the competition of the olden days was that business men mistrusted each other, and the principal trouble today in the relation of employer and employe is exactly the same.

While the members of the institute were meeting in St. Louis, another body was giving earnest attention to the problems of the industrial world. At the Ohio State University, Columbus, a congress of human engineering was held with the purpose of bringing about a closer understanding between engineers and the men who work for them. A brief report of the meeting will be found elsewhere in these columns. One paper to which the report refers only briefly is worthy of a more extended notice, that of C. J. Hicks, executive assistant to the president of the Colorado Fuel & Iron Co., which employs about 12,000 men at the coal and iron mines and coke ovens in western Colorado and in Wyoming, at the steel works at Pueblo and at other properties. The industrial representation plan, put into effect by the employes and directors of the Colorado Fuel & Iron Co., following a visit to the company's mines in September and October, 1915, by John D. Rockefeller Jr., has attracted much attention and Mr. Hicks' report in regard to it was very interesting. The betterment work as built up by the company was based primarily on fair treatment as to wages and working conditions. The company promised that it would, as rapidly as possible, expend whatever money might be necessary to provide sanitary and safe working conditions, modern toilet rooms, and such other conditions as would make real home life possible; that through the industrial representation plan every wage earner would be assured that he need not submit to any injustice, as any grievance would be considered and adjusted and the way opened to appeal to the president of the company or to the state industrial commission. The company also declared that it coveted a real partnership with its employes in all things pertaining to their living and working conditions and to this end the various joint committees provided for in the plant were developed. It declared that it stood ready to co-operate with social, educational and religious organizations of its employes.

Under the industrial representation plan, the employes were given representation through delegates of their own choice. The men of the company signed a written contract embodying wages, hours of service and other vital factors. Each district conference selected committees on industrial co-operation and conciliation, on safety and accidents, on sanitation, health and housing and on recreation and education. The committee on industrial co-operation and conciliation were entrusted with the task of preventing and settling industrial disputes and maintaining order and discipline in the various plants and camps. Elaborate machinery was provided by which the employe with a real or fancied grievance was given every safeguard for his rights. The company guarantees that there shall be no discrimination on account of membership or non-membership in any society, fraternity or union. It reserves the right to discharge employes for cause, but has posted a list of the only offenses for which a man may be discharged without notice. The plan at the outset applied only to the employes in the coal and iron mines, but during the past year has been adapted to the conditions in the steel industry.

This experiment in industrial conditions has now been in operation for more than a year and Mr. Hicks states that officials and employes of the company have entered into the spirit of co-operation and partnership heartily and that the results have been most satisfactory. Over 50 grievances have been investigated and settled. During the year, wages have been increased twice in the steel works and once at the mines and each of these wage adjustments was made in conference with the employes' representatives. There has been full discussion of living and working conditions at the joint conferences. The program is generally accepted as an honest attempt to establish fair and friendly relations between the company and its employes, not on the basis of paternalism, but on the basis of partnership and industrial democracy, and President Wilson declares that the plan is an unqualified success.

It is, we believe, too early to make enthusiastic predictions as to what will be accomplished by the Rockefeller plan, but surely the experience up to date is highly encouraging and developments will be awaited by many employers with keen interest.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products November 15, average for October, 1916, average for August, 1916, and average for November, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Nov. 15, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Bessemer pig iron, Pittsburgh..	$30.95	$24.325	$21.95	$17.45
Basic pig iron, Pittsburgh.....	25.95	20.825	18.95	16.70
No. 2 Fdy. pig iron, Pittsburgh	26.40	21.075	19.45	16.45
Northern No. 2, Fdy., Chgo..$27 to 28		19.15	19.00	17.12
Lake Superior Charcoal, Chgo..	25.75	20.35	19.75	17.50
Malleable, Chgo. .....$27 to 28		19.50	19.50	17.40
Southern No. 2, Birmingham...	20.00	15.13	13.75	13.13
Southern Ohio No. 2, Ironton..	23.00	19.38	18.50	16.13
Basic, eastern Pa.....	26.00	20.75	19.25	17.75
No. 2X Virginia furnace.....	24.00	18.50	18.50	15.50
No. 2X foundry, Philadelphia..	25.00	20.75	19.75	17.50
Ferro mang., Balti.....	164.00	162.00	175.00	100.00
Bessemer billets, Pbgh.....	50.00	45.75	43.60	27.75
Bess. sheet bars, Pbgh.....	50.00	45.75	43.60	28.25
Op.-h'th sh. bars, Pbgh.....	50.00	45.75	43.60	28.50
Open-hearth billets, Pbgh.....	50.00	45.75	43.60	28.00
Steel bars, Chgo.....	3.10	2.79	2.77	1.79
Steel bars, Pittsburgh, contr....	2.70	2.60	2.50	1.625
Iron bars, Philadelphia.....	2.659	2.659	2.559	1.759
Iron bars, Cleveland, local del'y.	2.60	2.55	2.40	1.50

	Prices Nov. 15, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Iron bars, Chgo. mill.....	$2.50	$2.35	$2.35	$1.48
Beams, Chgo.	3.30	2.80	2.77	1.79
Beams, Pittsburgh, contr.....	2.80	2.70	2.50	1.625
Beams, Philadelphia	3.009c	2.859	2.709	1.809
Tank plates, Pbgh., contract....	3.25	3.00	2.90	1.625
Tank p'ates, Chicago.....	3.50	3.19	3.17	1.79
Tank plates, Philadelphia.....	3.909	3.309	3.909	1.809
Sheets, blk., No. 28, Pbgh.....	4.00	3.225	2.75	2.22
Sheets, blue an., No. 10, Pbgh.	3.75	3.125	3.00	1.85
Sheets, galv., No. 28, Pbgh....	5.25	4.45	4.25	3.90
Wire nails, Pittsburgh.....	2.85	2.625	2.59	1.87
Connellsville fur. coke, contr...	3.75	3.375	2.40	2.35
Connellsville fdy. coke, contr...	5.00	4.875	3.15	2.96
Heavy melting steel, Pbgh.....	20.00	17.87	16.00	15.31
Heavy melting steel, east'n Pa..	20.00	15.50	15.00	14.50
Heavy melting steel, Chgo.....	19.25	16.50	14.90	13.15
No. 1 wrought eastern Pa.....	24.00	22.00	20.00	17.00
No. 1 wrought, Chgo.....	21.00	17.50	15.40	12.75
Rerolling rails, Chgo.....	25.50	18.75	15.70	14.30
Car wheels, Chgo.....	15.50	12.25	11.90	12.75

(For Additional Prices See Page 1024.)

Pig Iron Prices Reach High Points

Quotations Continue to Move Upward in Leading Centers—Shortage Expected in Some Places—Irregularity In the South

Philadelphia, Nov. 14.—Election results have had small effect upon the pig iron market in this district. Generally speaking, the volume of new inquiry and of sales has been lighter and the market has been less feverish. The price advance continues, however, and it is a question whether this fact has not been more responsible for less activity among buyers than any political influence. Much complaint is to be heard among producers as to car shortages, and they have found it impossible to keep abreast of their shipping demands for this reason.

Low phosphorus has been one of the grades to show exceptional activity during the week with new sales of not less than 20,000 to 25,000 tons, the largest part for last half of 1917, since makers are practically sold out before July. The Midvale Steel Co. bought 10,000 to 12,000 tons and the Bethlehem Steel Co. is credited with having purchased 6,000 tons. Steel foundries have continued in the market for 3,000 to 5,000 tons. The last sales of size in standard metal were at $42, furnace, or $44.62, Philadelphia, and the market now is quoted at $45, Philadelphia, flat. Lebanon makers want $38 to $40, furnace.

Basic is 50 cents higher, 1,000 tons for shipment by July having been sold to a platemaker at $26, delivered to a Jersey plant. One maker quoted $27, furnace on this order. On a 10,000-ton inquiry for last half of 1917 from central Pennsylvania, $26, furnace, or over $27, delivered, has been named. Other last half negotiations are under way. One maker of special basic is talking of $30, furnace.

Several eastern Pennsylvania makers of foundry iron are quoting $25, furnace, for No. 2X for delivery by April 1 and $26, furnace, up to July 1, and have made sales at both ends of this range. Other sellers are not quite so high, but the market is extremely strong and offerings are limited. Virginia No. 2X is from $24 to $25, furnace, with sales noted at both prices. Some makers hold for $25, minimum. Some Alabama iron is being offered here at $20, Birmingham. A sale of 500 tons of malleable was made at over $28, Philadelphia. Coke shortages still hold down production, both by keeping some furnaces banked and by blocking the blowing in of others.

Great Activity in New York

New York, Nov. 14.—Heavy buying and inquiry of an amount not before shown, has been sweeping through the pig iron market in metropolitan and surrounding districts during the past few days. Pending inquiry is not less than 200,000 tons, about equally divided between domestic and export. It is a commentary upon the swiftness of the recent rise in prices that certain of the heaviest eastern consumers who delayed their purchases are reported today in an uncovered position on a large part of their requirements for 1917 and now when they are endeavoring energetically to close, they are finding most of their usual sources of supply closed to them by previous sales. One consumer assigned by common report to this class, is seeking from 25,000 to 50,000 tons, for any delivery in 1917. The amount of iron offered for sale is comparatively light. Conditions in New England have been complicated further by the placing of an embargo on pig iron and coke by the New Haven road. Certain New England routes still are open, but it is feared these too will be closed soon. The consumers usually are in good position on iron stocks, but coke shortages promise to be serious. Eastern Pennsylvania makers, except in isolated cases, have not sold for last half. They quote from $25 to $26, furnace, or $25.75 to $26.75, tidewater, for No.

(*For complete prices see page* 1024.)

2X. The Virginia Iron, Coal & Coke Co., after selling heavily for last half at a final price of $24, furnace, for No. 2X, today withdrew entirely from the market. Buffalo basic has been sold in this district at $27.50, furnace, and No. 2X at $28.50, furnace.

Some of the new inquiries are 15,000 to 20,000 tons of foundry grades for the Worthington Pump & Machinery Corporation for last half; 6,000 to 8,000 tons of steelmaking grades; 4,000 tons of foundry for June-July-August for a Whitinville, Mass., consumer; 1,600 tons of foundry for the New York Central railroad. An Elizabethport buyer bought 2,000 tons of foundry and a Newark steelmaker has made a second purchase of 5,000 to 10,000 tons of northern basic. Apparently bona fide new export inquiries of bessemer for Italy and France total 50,000 to 60,000 tons for delivery by April. Another inquiry calls for 10,000 tons of Alabama foundry and for 5,000 tons of basic. Sweden still is buying heavily. An export sale of 2,500 tons of Alabama No. 2 was made at $20.50, Birmingham, and two transactions totaling 4,500 tons, were at $20. Foreign buyers this week paid $26, furnace, for Tennessee No. 2 and $25, furnace, for eastern Pennsylvania No. 2 plain.

Demand Exceeds Supply

Buffalo, Nov. 14.—Consumers of the Buffalo district are being forced to seek needed tonnages of various grades of iron for nearby and future consumption in other markets, owing to the sold up condition of the furnaces of this section. All of the producers report that they are oversold. One interest is out of the market until Jan. 1, 1918, another is sold up solid until last quarter of 1917 and a third producer is indisposed to take on additional tonnages for deliveries as remote as previous sales will advance them into the latter part of next year. The prevailing minimum seems to be $27 on any grade. No. 2X foundry being sold at $27 to $28. $27.50 is the minimum on basic and bessemer has again advanced to $30 to $31.

The sales for the week amounted to a total of 12,000 to 15,000 tons. While the placement for the week fell below the total for the previous week, it was not due to a falling off in the demand on the heels of the advances previously reported, but to the inability of the furnaces to take on additional tonnages for the periods needed by the consumers.

The inquiry coming into the market covers all grades and for deliveries extending over all of 1917. While some buyers have temporarily held up on account of price advances, other consumers whose needs are more urgent have come into the market to take their place, so that the volume of the inquiry as a whole has increased rather than diminished in the face of the sharp shrinkage in the apparent available supply. If there is to be an improvement in the situation, it will have to develop later. The signs of it are not apparent at present.

Prices Fluctuating

Cincinnati, Nov. 14. — The price of southern No. 2 foundry iron today is $20; Birmingham basis, for any delivery over 1917. This quotation is being made by one furnace interest only, although several will accept $20 for the last half of the year. The prevailing price for the first half of next year ranges all the way from $21 to $22.50. Yesterday southern No. 2 foundry iron from both Alabama and Tennessee was offered at $19, Birmingham basis, but this price was withdrawn early today. Spot iron is in good demand and very scarce, with the result that premiums are being asked and received without comment.

Southern Ohio iron is not fluctuating as much as southern iron. None is available from that district for the first half of next year. The price for the last half of 1917 is from $23 to $25, Ironton basis, for No. 2 foundry.

General inquiry is light, and most business is secured through direct solicitation. The International Steam Pump Co. is in the market for from 16,000 to 18,000 tons of foundry iron for its various plants, for shipments at different intervals during 1917. The Louisville & Nashville railroad has purchased around 1,200 tons of various grades of foundry iron for shipment beginning this month, and extending into the first half of next year.

Drive Continues

Pittsburgh, Nov. 14.—Prices of pig iron continue to swing upward rapidly in the Pittsburgh district. Bessemer pig iron has touched the $30 mark, the highest price reported in many years and other grades are correspondingly high. The advancing tendency of the market for bessemer iron appears to have been caused partly by the threatened scarcity of bessemer ore for shipment in the 1917 season. Shippers of ore have gone over the situation carefully, locating all available tonnages of bessemer ore for shipment next year. If present consuming rates are maintained through 1917, the bessemer ore supply will fall several millions of tons below estimated demand, it is pointed out by usually well informed ore merchants.

The American Rolling Mill Co. last week bought 4,500 tons of bessemer iron for shipment to the Marshall Foundry Co., which will convert the iron into ingot molds. This iron was obtained at $28, valley. Shortly after the consummation of this transaction, bessemer iron jumped to $29, valley, at which figure several thousands of tons were sold, and before the end of the week the $30 figure, talked about ever since Jan. 1, last, actually was touched when a furnace sold 1,000 tons for shipment the first quarter of next year at $30, valley. A Pittsburgh middleman was an active seller of bessemer iron at $29, valley. The United Alloy Steel Corporation, Canton, O., last Friday bought 2,000 tons of standard basic iron for prompt shipment at $24, valley. Dealers now are asking $27, valley, for this grade, but no sales above $25 have been reported in the open market. A nearby stack has sold rather heavy tonnages on the basis of $25, valley, for shipment the second half of next year. Foundry and malleable irons are being held at $26 by most concerns. The Pressed Steel Car Co. a few days ago bought 2,000 tons of malleable iron at $25, valley, for shipment after July 1, next. Quotations below $26, valley, rapidly are disappearing.

No. 4 furnace of the Shenango Furnace Co., Sharpsville, Pa., which went out of blast Thursday morning, Oct. 19, resumed operations yesterday noon. In a period of 25 days, the stack was provided with a new lining, a new hearth jacket, a new downcomer and the stoves and one of the boilers were rebuilt. The capacity of the stack, now operating on basic iron, was increased from 225 tons to 300 tons a day.

Chicago Advance Continues

Chicago, Nov. 14.—Northern pig iron —foundry, malleable and basic—continues to advance rapidly and the leading maker is now holding its product at $27 to $28, furnace, for first half delivery. Sales have been made at $26 and higher for the past two days, and $27 was done this morning.

Inquiry continues fairly active and although most melters have covered themselves well for first half, there still remains sufficient unsatisfied demand in the market to give considerable activity, and the aggregate of sales is good. Northern furnaces have comparatively little tonnage remaining for delivery during first half and at the present rate of buying this probably will be exhausted in a short time.

Some inquiry is being received from larger users for quotations on last half iron, but this has not become a factor in the market yet. It is believed no difference will be made in quotation between first and last half iron when furnaces feel ready to take on unlimited business for the later delivery.

Lake Superior charcoal iron is also

(*For complete prices see page* 1024.)

advancing, and the range of prices now is $25 to $26, furnace, the equivalent of $26.75 to $27.75, delivered, Chicago. A difference which previously existed between quotations of various makers seems to have disappeared and they are all apparently on the same level.

Southern iron is being sold at $20, Birmingham, for No. 2 foundry. With this difference between southern and northern, many users are turning to the southern iron, and sales of this grade have been large. Last half business in southern iron is said to have been heavy, especially among larger users, and furnaces have booked large tonnages for that delivery. The price for first and second half apparently is the same. Some furnaces are quoting as high as $23, Birmingham, for No. 2 foundry, which indicates they do not desire to take further business at this time.

Advancing at Birmingham

Birmingham, Ala., Nov. 13.—Another advance of $1.50 per ton has been recorded in the Birmingham district during the week just closed. The market is now considered firm at $19 to $20 per ton f. o. b. cars at the furnace for any delivery up to and including the first half of 1917. The largest pig iron producer in the district advised that $19 per ton is their minimum figure, and that before the middle of next week $20 would be the minimum figure. The other producing interests are already holding firmly at $20 per ton at the furnace. Some large sales have been made on that basis, and now practically every furnace company is out of the market for the first half of next year. Serious consideration is being given the opening of books for at least the third quarter of next year, and possibly the entire last half. A firm offer was tendered during the week for 75,000 tons of basic iron at $20 per ton at the furnace, backed up by an indemnity bond as an assurance of its being taken regardless of market conditions. As yet, the order has not been accepted. The booking of this order would be equivalent to the entire output of a 200 to 225-ton stack during the year.

Pig iron production in the district eclipsed all records last month. The Republic Iron & Steel Co. reports that its third furnace at Thomas will not be blown in before the first of the year owing to the acute car shortage which now exists. Iron is being piled on yards by reason of insufficient car supply.

Inactive at St. Louis

St. Louis, Nov. 13.—The local market is almost devoid of inquiries for pig iron, but, owing to sales amounting to upwards of 15,000 tons of various grades last week, sales agents continue to be hopeful that good business is in sight. Prices are stiffening, and the belief prevailed that they will continue to rise. No. 2, Southern iron is strong at $20 to $21 a ton for prompt delivery, Birmingham basis, and at $21 a ton, for first half delivery. Northern iron is firm at $25 Chicago, and $25 to $26, Ironton.

Cleveland Prices Higher

Cleveland, Nov. 14.—One Cleveland company after selling several lots of good size at $25, furnace, for No. 2, advanced to $26 and the Cleveland market is now quotable at $25 to $26. It is confidently predicted that there will be a pig iron shortage in this district before many months. Owing to the labor troubles and some other unfavorable conditions, the melt in the Cleveland district has not been as heavy as was expected, but it is known that the foundries must buy considerable iron for the first half of next year. It is very doubtful whether it can be obtained.

A Mahoning valley producer sold 6,000 tons of basic late Monday afternoon at $25. It is understood that this iron is for first quarter delivery.

Wire Nails

Will Probably Advance in Price—Mills Pressed for Deliveries

Pittsburgh, Nov. 14. — Wire makers experienced no difficulty in establishing advanced quotations adopted Nov. 4, and some mills already have withdrawn from the market. Wire nails now quoted at $2.85 a keg, likely will advance to $3 or even $3.25 a keg before the second quarter of next year and other products will register corresponding advances in price. Specifications from domestic consumers continue heavy and demand for shipment to Europe, South America and the far east has not fallen off.

Pressed for Deliveries

Buffalo, Nov. 14.—Canadian interests came into the market here with inquiries for large tonnages of wire rods, but as far as could be learned none of the producing interests was in a position to entertain the business offered.

Mills are being pressed for deliveries on nails by jobbers who had but recently reported they were well stocked. This change is said to be due to the increasing demand upon the dealers by the consumers. The demand for nails seems to be heavier than it has been in years.

Quotes $3 on Coated Nails

Cleveland, Nov. 14.—The ordinary quotation on coated nails is $2.75, but the filled-up condition of the mills is illustrated by the fact that one large producer has quoted $3 and was not anxious to take the business at that price. One of the largest companies is not taking any orders at the present time.

Warehouse Prices

Have Again Been Advanced on Some Products

Chicago, Nov. 14.—Chicago warehouses have advanced steel sheets $3 to $4 per ton, effective immediately. No. 10 gage blue annealed have been marked up from 3.65c to 3.80c while No. 28 gage black are advanced from 3.90c to 4.10c.

Prices Moved Up

New York, Nov. 14.—Prices on plates from warehouse again have been advanced $5 per ton in the metropolitan district. The new schedule places wide plates at 4.75c, and narrow plates at 4.50c, delivered. Steel bars and structural shapes from store now are quoted at 3.50c, representing a recent advance of $3 per ton.

Variety of Prices

Philadelphia, Nov. 14.—Jobbers in this territory have been quoting steel bars and shapes at 3.40c, delivered, and some of them now have advanced to 3.50c, delivered. A variety of prices is being shown on plates with a range of about 4.25c to 4.75c, delivered.

Cincinnati Prices Up

Cincinnati, Nov. 13.—Warehouse prices have advanced. Cold rolled bars are still given at 10 plus the list price, but iron and steel bars are now being held from 3.45c to 4c, and shapes and plates from 3.50c to 3.90c. No. 10 blue annealed sheets are now quoted at 3.90c, No. 28 galvanized sheets at 5.40c, and black No. 28 gauge at 3.90c. All of these prices are f. o. b., Cincinnati. Business is good and warehouses are finding it a difficult matter to make shipments. Demand appears to be centered principally around light structurals.

Galvanized Advanced

Cleveland, Nov. 14.—Since recent advances in prices of shapes, plates and bars, warehouse business has continued active. The price of galvanized sheets has again been marked up and is now quoted on a basis of 5.50c for No. 28 gage, an advance of $5 per ton compared with the previous week. The price of tin plate from warehouse has been advanced 80 cents and it is now selling at $14 per box.

(*For complete prices see page* 1024.)

Bar Orders Are Refused

By Leading Independent Company, Which also Declines to Book Other Finished Materials—Foreigners Close Quickly

Cleveland, Nov. 14.—One leading independent company has refused to book any business in bars, shapes, plates, tin plate or wire products for the reason that the volume of orders which it now has is extremely large and deliveries are so far delayed that it does not feel that it can take on further obligations at the present time. Other companies are still booking contracts, but in a very conservative way. If, for example, a consumer has a contract which at the present rate of delivery will be cleaned up by March 1, some additional tonnage will be booked, but steel companies generally recognize that they are badly oversold and are trying to prevent further piling up of unfilled tonnage. Special consideration is being given to the regular trade. One large independent company is quoting 3c, Pittsburgh, on bars and shapes and 4c on plates for first quarter.

Bar iron has advanced sharply on account of demand and also because of coal shortage, and is quoted 2.60c to 2.70c.

More Contracts Expected

New York, Nov. 14.—No general distribution of large contracts for shell steel for last half of 1917 delivery yet has been made by the allied governments under the recent negotiations instituted with various mills by J. P. Morgan & Co. There have been some press reports in circulation during the past few days that some of these contracts of heavy proportions had been closed with Pennsylvania makers, but these proved to be unfounded. It is believed, however, that the placing of contracts will be a matter of the very near future. It is known that steelmakers in the aggregate have offered to supply more than 1,000,000 tons of shell steel for the last half, but whether all this will be taken up finally, is not certain at this time, although the general disposition of the belligerent buyers in the past has been to close for all the material that could be offered to them for a specified delivery. The prices quoted on shell steel for the last half of 1917, as previously stated, have ranged from 4c to 4.50c, mill, and these propositions both as to tonnage and quotations, for several weeks have been before the British and French authorities who have final authority for passing upon these contracts.

Foreigners Buy Quickly

Philadelphia, Nov. 14.—One large independent maker of steel bars now is quoting 3c, Pittsburgh, for first quarter for that product in connection with structural shapes. This producer has made no straight bar quotation for the first quarter as yet, but the chances are when this is done, it will be not less than 3c, Pittsburgh. Other makers are quoting from 2.75c to 2.80c, Pittsburgh, which are practically nominal prices, since these mills are not disposed to sell. There is not much activity for the first quarter and a number of buyers yet are to close contracts for specification in that period and for delivery at the mills' convenience. Makers say that practically any offers of bar tonnage they are able to make to foreign buyers are quickly snapped up.

Prices But Nominal

Buffalo, Nov. 14.—Mills and agencies are now quoting 2.75c and upwards for bars and small shapes. The principal interest for the present is holding to 2.70c, base. These prices, however, are but nominal, as actual acceptances are bringing much higher figures where consumers find it possible to get their needs booked by the mills. Sales have been made during the week on carload lots of bars, subject to delivery at mill's convenience at 2.85c to 3c flat.

Bar Demand Continues

Chicago, Nov. 14. — The situation in soft steel bars, which is the same as in all forms of finished steel, remains practically unchanged from the past few weeks. Consumers continue to place their contracts with the leading interest for indefinite delivery at the prevailing nominal quotation, 2.89c, Chicago mill, and although mills are shipping at a record rate, new business is being taken at a much higher rate, in some instances 50 per cent in excess of production. Mills are approximately nine months behind on deliveries, and are rolling material now which was specified last February.

Hard steel bars rerolled from rails are quoted at 2.60c, Chicago, and are strong at this price. Demand is increasing, as various consumers find they can use hard steel in place of soft and obtain better deliveries. Considerable demand also is coming from the southern portion of the country for bars to be used in reenforced concrete work, which is carried on through the winter.

Strong at Pittsburgh

Pittsburgh, Nov. 14.—Heavy demand exists for steel bars, which are being quoted at from 2.70c to 2.80c for shipment at the convenience of the maker. Demand for rounds for the manufacture of munitions has not fallen off, some prospective purchasers attempting to buy for delivery the second quarter of 1917.

Bar Iron Advancing

Chicago, Nov. 14.—Quotations on bar iron in the Chicago district are mounting steadily, and the minimum figure now available seems to be 2.50c, Chicago mill, with the top of the market probably 2.60c, Chicago mill. This price is believed to be only temporary and as high as 2.75c, Chicago, is predicted as a development of the near future.

Selling during the past month for first half delivery has been such that most mills have disposed of the larger portions of their production for that period, and those who sold less have booked a comfortable tonnage beyond the first of the year. The strong demand which has been evident for some time continues, though somewhat less in volume, and every sign points to a strong market through the remainder of the year.

Shafting Prices Hardening

Pittsburgh, Nov. 14.—Prices of cold rolled steel shafting are hardening. While some of the larger consumers are able to buy at 20 per cent off the list, the market rapidly is being established at 15 per cent off the list and it appears as if material for second quarter delivery will command not less than 10 per cent off the list. Deliveries are said to be somewhat more satisfactory.

Hoops and Bands

Pittsburgh, Nov. 14.—Manufacturers have made no changes in prices of hoops and bands for delivery at their convenience, hoops being quoted at 3.25c and bands at 2.70c. Some mills, however, are asking from $5 to $7 a ton above those figures for nearby delivery. One of the larger makers cannot promise additional tonnages for shipment before July 1.

Another general advance of 10 per cent in wages has been announced by the Phoenix Iron Works, Phoenixville, Pa., effective Nov. 20. This is the fourth general advance made by this company during the past two years.

(*For complete prices see page* 1024.)

Sheet Makers Withdraw

Many Are Not Willing to Quote Under Present Conditions—Large Undelivered Tonnages Will Be Carried Over Into Next Year

Youngstown, O., Nov. 14.—Manufacturers of sheets are rapidly withdrawing from the market. Many mills are refusing to quote on any more inquiries. Prices continue very firm and the tonnage actually sold this week brought prices well above the quotations of a week ago. Black sheets today are quotable at a minimum of 4c, blue annealed sheets at 3.75c and galvanized sheets at 5.25c.

The causes for manufacturers refusing to quote on additional inquiries are readily determined. Sheet production, while maintained at a high rate for months past, has not been heavy enough to free order books of accumulated tonnages and practically all mills will carry over into next year a large tonnage of present quarter business. In one case, a mill estimated that one-half of the present bookings would not be delivered by Jan. 1. Another cause is found in the uncertainty concerning costs next year. Sheet bars are steadily rising in price, labor is more expensive and spelter is uncertain. In addition, deliveries of raw steel from the steel mills are slow and, in view of the present car shortage, these deliveries are not likely to improve soon. A large tonnage of first quarter business has already been taken. These causes have been sufficient to persuade most sheet producers that additional first quarter business should be refused.

Current sales have consequently been cut down. Black sheets have sold up to 4.25c and 4.50c during the week and it is improbable that any prompt business would be taken at less than 4c today. Export inquiries continue very heavy, but foreign buyers are finding increasing difficulty in placing their business.

Galvanized sheets are strong and are selling at 5.25c to 6c. Today's minimum on coated sheets in this district is 5.50c. Domestic buyers, particularly southern consumers of roofing products, are returning to the market and trying to line up tonnage.

Blue annealed sheet prices are stiffening and 3.75c is the minimum. Some good-sized orders, both for domestic and foreign delivery, have been reaching local mills and the impression is growing that this grade will be established at 4c shortly.

The coal and car situation is serious. Some mills are well protected on their supplies and deliveries of fuel while others are running on a narrow margin. The car shortage has crippled both incoming and outgoing shipments. One galvanizing plant was shut down for a time last week waiting for two carloads of spelter which were long overdue. Deliveries of sheet bars from steel mills also are uncertain. Outgoing shipments are piling up on warehouse floors. Sheetmakers are trying to induce consumers to accept sheets in gondolas, but even this expedient has done little to relieve the situation. One mill manager stated today that his deliveries so far this month on finished products were only 30 per cent of the tonnage turned out by his finishing mills.

Upward Trend Continues

Canton, O., Nov. 15.—The steady upward trend of the sheet market in this territory continues, but there is practically no tonnage for sale. Those manufacturers who have not sold their first and second quarter, 1917, output have not as yet opened their books for next year's trade, and because of the high and increasing cost of materials will not quote 1917 prices much before Dec. 15. One firm is out of the market until May 1, 1917.

The ruling price of black sheets is around 4.50c; blue annealed, 4.50c, and galvanized, 6c. Inquiries for thousands of tons, especially from foreign representatives, are turned away daily. Prospective buyers for export resort to the expedient, frowned on by producers, of buying a little here and there from regular domestic customers who are given first call by the manufacturers.

Car shortage is troubling most of the mills; some of them are losing several hours each day because of failures to deliver steel.

Withdrawing from the Market

Pittsburgh, Nov. 14.—Several of the more prominent sheetmakers in western Pennsylvania virtually have withdrawn from the market for delivery the next six months. Demand for all grades continues decidedly heavy and the threatened scarcity of material seems to be developing rapidly. Some sheetmakers say many consumers will be seriously handicapped next year, on account of inability to cover needs. Galvanized sheets are being held at as high as 5.50c, base, although the 5c quotation has not entirely disappeared. Bessemer steel sheets are selling at 2.65c as a minimum and blue annealed products are commanding 3.25c for No. 10 gage. Blue annealed sheets are selling at wide ranges in price, no two manufacturers maintaining the same differentials.

The bi-monthly examination of sales sheets of mills working under the wage scales of the Amalgamated Association, last Saturday developed an average price of 2.75c for Nos. 26, 27 and 28 gages, plain steel sheets. This price entitles sheet mill employes to an increase in wages 18 per cent above the base, which is figured on a 2.15c card.

Advance Sheets in East

Philadelphia, Nov. 14.—Eastern Pennsylvania makers of sheets have made a new advance of $5 a ton and now quote 3.75c, Pittsburgh, or 3.909c, Philadelphia, for No. 10 gage blue annealed as their minimum. Apparently other makers still will do 3.50c, Pittsburgh. Eastern producers continue to book a good tonnage of new business for the first and second quarters, some of it at the 3.75c price. The eastern mills are quoting sparingly on the export inquiries for sheets, of which those pending at present total 10,000 tons or more.

Go Higher at Chicago

Chicago, Nov. 14.—Demand for steel sheets, both black and blue annealed, continues, and mills in a position to assume further contracts are booking a comfortable business. No. 28 gage black are quoted at 3.94c, Chicago, while No. 10 gage blue annealed have stiffened to a higher level and now are quoted at 3.69c to 3.94c, Chicago mill.

The galvanized situation remains practically unchanged with the ruling quotation 5.19c, Chicago mill, for No. 28 gage.

Refuse to Quote

Cleveland, Nov. 14.—Owing to the scarcity of sheet bars, the higher prices which they command and the very active demand for sheets, mills are refusing to quote and buyers are finding much difficulty in placing orders. Cleveland mills are quoting 4c on No. 10 sheets and light plates. Cleveland mills are now quoting 4c as a minimum and the very high prices on plates announced by eastern mills last week are being continued on a basis of 3.75c for universal plates and 4.75c on sheared plates.

Grover C. Leonard, general manager of the Sturtevant Aeroplane Co., Jamaica Plain, Mass., announces that the United States government has placed an order with it for 24 machines, costing $219,600.

(For complete prices see page 1024.)

Billets Strong

Sales Not Numerous—Sheet Bars Held at $55

Youngstown, O., Nov. 14.—The semi-finished steel market continues to gain strength. While actual sales are few, the market shows a continually stronger undertone. A sale of ingots at $40 a ton is reported in this district. Sheet producers, in some instances, are sounding out the steel mills for first quarter sheet bars. One offer of $52 for sheet bars was made by a sheet mill this week without success. The impression prevails that sheet mills which are not protected by contracts will be asked to pay $55 for what tonnage they are able to line up. The car shortage has so hampered shipments that there is a possibility that some finishing mills may shut down for several days, which will enable steelmaking units to catch up on deliveries to those departments. Shell steel inquiries continue to reach the mills and buyers offer 4c and 4.25c readily. Little unsold shell steel capacity is available in this district for delivery before the fourth quarter of 1917.

In the Cleveland district, discards have been sold at $70.

Inquiry More Active

Philadelphia, Nov. 14.—Increased inquiry for billets is coming to eastern Pennsylvania makers from domestic consumers for delivery over the first half and through the third quarter of 1917. There is some new selling of both rerolling and forging steel, but where any tonnage is involved it is usually for delivery beyond July, since the makers are practically filled until then, and higher prices are being paid. On rerollers, $55, mill, and on forging steel from $65 to $75, mill, are quoted. Some producers confine their offers only to forging quality. The mills are insisting resolutely that every tonnage placed must be considered as an absolute and non-cancellable sale. This has caused numerous buyers to cut down their estimated requirements when finally closing, in some cases practically halving them. The market shows the usual heavy inquiries for billets for export which are being passed by the makers.

Takes Over Ore Property

New York, Nov. 14.—The Tidewater Iron Corporation, recently incorporated, has taken over the iron ore property of the Eastern Ore Corporation, comprising 140 acres at Garrison, across the Hudson from West Point, N. Y., and 200 acres at Pawling, N. Y. The Garrison ore is magnetite, which analyzes 55 to 62 per cent, while the concentrates analyze 66 to 68 per cent. The company is shipping ore at the rate of 100 tons per day from this property and expects within six months to increase its output to 500 to 600 tons per day. The ore at Pawling, N. Y., is brown hematite, analyzing 55 per cent. It has a manganese content of 2 to 3 per cent and this occasionally runs as high as 16 per cent. Col. J. E. Fuller, Hotel Imperial, New York, is president of the company, and Frederick J. Pullen secretary and treasurer.

Tin Plate Mills

Will be Built by American Sheet & Tin Plate Co. at Two Plants

Pittsburgh, Nov. 14.—The American Sheet & Tin Plate Co. has awarded contracts for 20 additional tin plate mills, 10 of which will be installed at Farrell and 10 at New Castle, Pa. The Farrell plant now contains 20 mills and the Shenango plant 30 mills. The company will push this work through with all possible haste, in an effort to meet the heavy demand for tin plate.

Pressure for tin plate continues very heavy. Most of the leading makers have withdrawn from the market, having no additional tonnage to offer for shipment the first half of next year. A mill in adjacent territory reports the sale of 50,000 boxes for shipment abroad at $7, base. All quotations below $6, base, have disappeared. An inquiry for several millions of boxes for shipment abroad is still pending.

Cold Rolled Strip Steel

Pittsburgh, Nov. 14.—Manufacturers of cold rolled strip steel continue to quote from 6.50c to 7c, base, for shipment the first quarter of 1917. So far as can be learned, no tonnage is being offered for delivery after March 31. For prompt shipment, as high as 10c is being obtained.

Nuts, Bolts and Rivets

Pittsburgh, Nov. 14.—Manufacturers predict that prices of nuts, bolts and rivets will be put up at an early date. Domestic demand continues heavy and mills are being called upon for large tonnages for foreign shipment. Some makers seriously are handicapped by deferred shipments of steel bars.

R. B. Weaver has returned to the Timken-Detroit Axle Co. as chief engineer, to succeed J. G. Perrin, who recently resigned.

Ferro Prices

Are Said to be Firmer, But Sales Are Still Made at $160, Furnace

New York, Nov. 14.—While there is talk of a firmer condition of prices on domestic ferro-manganese around $165, delivered, as the result of heavier selling, it is known that sizeable sales for forward delivery have continued to be made down to $160, furnace. There are reports, in fact, that this latter figure has been shaded. As the situation now stands, it is apparent that ferro-manganese for early shipment has been stronger than for the first half of 1917 or for the more extended future. All the shading appears to be confined to the domestic product since English metal still is held at $164, seaboard, and this price is bringing forth very few sales. Openly, there have been very few purchases by the large consumers for the first half of 1917, but some reports are current that several important transactions have been put through quietly. Some of these purchases have been made by middlemen. One large consumer who recently has been inquiring for 5,000 tons or more is said to have satisfied this requirement with a domestic producer, but this is not confirmed. A sale of 2,000 tons for export is reported closed. The Canadian Steel Foundries has been in the market for 2,000 tons for forward delivery. Other export inquiries for about 500 tons are current.

Spiegeleisen prices also show the effect of larger sales recently. Where $40, furnace, was done for last half of 1917, $45 now is minimum and some makers want $50, furnace, for 20 per cent. Fifty per cent ferro-silicon for early delivery is stronger, and $100, furnace, is better held. This price also applies to moderate lots for future shipment, though it is expected concessions would be made for larger amounts.

Spiegeleisen Advances

Pittsburgh, Nov. 14.—One of the largest consumers in this district last week paid $44, furnace, for spiegeleisen for first half shipment; another prominent consumer a day later bought material at $45, furnace, for similar delivery, and small tonnages have since been sold at $50, furnace, or $7 a ton above the previously prevailing minimum price. Demand for spiegeleisen is described as fairly heavy. The market for other ferro-alloys, including ferro-manganese and ferro-silicon, is not so active as it was a week or 10 days ago, but prices are being held firmly.

(For complete prices see page 1024.)

Plate Tonnage Piles High

Buyers Willing to Place Large Orders at High Prices—Atlantic and Pacific Coast Ship Yards in the Market

Philadelphia, Nov. 14.—There still seems to be practically no limit to the tonnages of plates that many buyers are seeking or the prices they are willing to pay for desired deliveries. One eastern Pennsylvania maker in today's mail alone received total requests for 42,000 tons of new business divided among ship yards, car builders, structural shops, etc., and for delivery through the first quarter of 1918. Another producer has obligated himself on so large a tonnage for prospective ship building work that he has declined to make any further quotations until some of the pending lots are acted upon. Then he will quote 5c, Pittsburgh, as a minimum on ship plates, Lloyds specifications, against 4.50c at the present time. Ship plates with eastern mills seemingly are at a minimum of 4.50c, Pittsburgh, and from that up to 6c, Pittsburgh, is named. The latter price was asked by one mill this week on 2,000 tons for the last half of 1917. A sale of 600 tons was made at 5.50c, Pittsburgh. Both Atlantic and Pacific coast yards are in the market for heavy tonnages, mainly for new vessel contracts now being bid upon. One Delaware river builder wants 4,000 to 4,500 tons. Heavy tonnages are wanted constantly for export. Following a new sale of 15,000 tons of ship plates to Italy at slightly under 4.50c, Pittsburgh, an eastern mill has sold 10,000 to 12,000 tons to Japan at 4.50c, Pittsburgh. A Canadian merchant who has been inquiring recently for a total of about 50,000 tons for transatlantic delivery, now wants 14,000 tons very urgently for early delivery. Sheared tank steel is bringing higher prices. The eastern Pennsylvania maker who advanced last week to 4.75c, Pittsburgh, reports numerous sales at that figure. Other makers are talking 4c, Pittsburgh, on tank, but it is probable 3.75c still can be done with some mills. Universal plates are stronger and some mills ask 4c, Pittsburgh. Recent quotations to car builders as low as 3.25c, Pittsburgh, are reported. Car shops continue to buy freely. One producer this week booked 8,000 to 10,000 tons for first quarter, including 2,000 tons additional for the Pennsylvania railroad. The American Car & Foundry Co. has closed for further tonnage. Numerous contract buyers are offering to place tonnage lots for the first and second halves of 1917.

A large car builder this week bought 2,000 tons of plates for prompt shipments at 3.50c. Half of the tonnage will be delivered in one week and the remainder immediately afterward. This price is the maximum paid by car builders, previous prices ranging from 3c to 3.25c.

Traffic Situation More Complicated

Pittsburgh, Nov. 14. — Congested traffic conditions are further complicating the movement of semi-finished and finished steel products. Sales managers of some of the larger mills in this district are devoting a large part of their time in following shipments from the mill. The Pennsylvania Lines West on Monday declared an embargo against the Pennsylvania Railroad Co. on all products, except coke and perishable goods. This movement seriously has handicapped consumers of coal, pig iron and finished steel products.

Steel plates continue to be quoted at 3.25c for delivery at the convenience of the mill, but most manufacturers are not figuring in the market, having no additional material to offer for shipment before July 1, next. For prompt delivery, mills are obtaining 4c without difficulty. Demand for car and ship material continues to be the outstanding feature of the market.

Demand Strong in Chicago

Chicago, Nov. 14.—Although tremendous tonnages of steel plates have been contracted on the part of domestic buyers for export, the demand continues and car builders, ship builders and other users are seeking, often in vain, to place further business in plates. The quotation is 3.44c, Chicago mill, and the delivery probable on orders placed now is late next year.

Cast Pipe Higher

Quotations Moved Up $3 at Chicago and $1 in South

Chicago, Nov. 14.—Following the advance of $1 per ton in cast iron pipe announced last week, a further increase of $3 per ton is made this week. This is done to keep up with the rapid advance in the cost of pig iron, and makes the quotation on 4-inch pipe at Chicago $38 to $39, and on 6-inch and larger sizes, $35 to $36 delivered, Chicago. Aside from the two lettings on which figures were to be opened this week at Chicago, involving 18,000 tons, little business is in prospect. Bids will be opened Nov. 15 at Winnipeg, Man., on 300 tons, and Nov. 17 at Duluth on 1,500 tons.

Advance of $5

New York, Nov. 14. — Another advance of $5, a ton, has been adopted by manufacturers of cast iron pipe. This places 3-inch, Class B at $37.50, New York, and 4-inch at $40.50, New York. Cast iron pipe now has advanced about $6 a ton, in about two weeks. Municipalities are holding off from placing contracts because of the advanced prices, but there is a very liberal activity among the gas and water companies for shipments extending through the first half of 1917 and beyond. Makers are perdicting further advances if the present pig iron movement continues.

Advance in South

Birmingham, Ala., Nov. 13.—The cast iron pipe market has advanced $1 per ton over the previous week's prices, and manufacturers report that conditions have become more or less slack by reason of the increased higher prices. It is the opinion of one large producer that the present prices of pig iron are likely to more or less stagnate the cast iron pipe industry.

Ore Movement

Is Somewhat Delayed by Cold Weather at Upper Lake Ports

Cleveland, Nov. 14.—With the thermometer at 4 to 6 degrees above zero at the head of the lakes, iron ore has been freezing rapidly and shipments have been delayed. The delay at the head of the lakes is, however, giving lower lake docks an opportunity to catch up and it seems probable that the November record will be equal to that of any November in the history of the lakes.

Representatives of ore sellers who are keeping closely in touch with consumers report that the latter have no interest in ore prices. Being covered for all their expected requirements, blast furnace owners are content to pay whatever price may prevail. At some furnaces in the east, trouble is being experienced in obtaining storage capacity. Stacks of the Bethlehem Steel Co. are now obtaining from Chile about half the tonnage of ore necessary to meet their requirements.

Carl O. Nielson, representative in Norway of the United States Steel Products Co., arrived in this country Nov. 11.

(For complete prices see page 1024.)

Scrap Higher Than Ever

Chicago Market Ascends to Point Beyond any in Past—Cleveland Dealers Worried by Talks of Higher Demurrage Rates

Chicago, Nov. 14.—Apparently there is no limit to the height to which prices of iron and steel scrap can go. Advances have been made steadily over the past few weeks, until the general level is far beyond anything that has been made in the past. It was believed that a limit would be reached before this time, but consumers seem to need further supplies and are still in the market, with the result that prices are pushed upward steadily.

Railroad offerings continue to be meager, and until larger supplies are available from that source, a shortage probably will exist. The Southern Railroad is offering 3,400 tons, the Missouri, Kansas & Texas railroad, 1,050 tons, the Michigan Central, 1,070 tons, and the Soo Line, 40 tons.

Prices Advance Again

Buffalo, Nov. 14.—A particularly heavy demand from western markets for various lines has caused prices to sharply advance on practically all grades of scrap. Heavy melting steel has gone to $19.25 to $20 and No. 1 railroad and machine cast scrap has advanced to $19 to $20, remaining strong at the new figure.

One consuming interest has purchased in the past week or 10 days 15,000 to 20,000 tons of steel scrap to cover its needs for a number of months to come. Dealers report that some small sales of car wheels were made at $16 to $18, but that the minimum of the market now is $17. Sales of stove plate in the Buffalo market are now being made on a basis of gross tons instead of net tons and the gross ton price prevailing now is $14.25 to $14.75.

General Advances

Philadelphia, Nov. 14.—Heavy melting steel, which has been the laggard grade in the eastern Pennsylvania scrap market, now has come to the front, and one plant has purchased 5,000 to 10,000 tons at $20, delivered. This price is $2.50 above the last quotation, which, however, was practically nominal and had been made by buying by the brokers. Pittsburgh is offering $20.50, delivered, and more for steel. Some of the eastern steelmakers still will not offer over $17.50, delivered. All grades of scrap again have advanced sharply the past week, and in some of these, including car wheels, rerolling rails and low phosphorus, the rise has been $1 or more. Low phosphorus was sold to one consumer this week at $30, delivered eastern Pennsylvania. Wrought pipe has brought $17.50.

Prices Climbing

Pittsburgh, Nov. 14.—Several of the independent mills in western Pennsylvania have been figuring in the market for heavy melting steel this week. Some dealers are asking $21 and $21.50 for this grade, although one consumer claims to have purchased a fairly heavy tonnage at $19.20, delivered, about a week ago. The leading interest has not figured in the market recently. Blast furnace managers continue to buy heavy tonnages of turnings and borings, paying from $9 to $9.75 a ton for large lots. Other grades of iron and steel scrap have registered advances ranging from 50 cents to $1 a ton this week.

Steel Moving Up

Cleveland, Nov. 14.—Advances in the prices of mostly all grades of iron and steel scrap again were witnessed in the market during the past few days. Foundry grades especially have gone up due to demands arising from consumers, but steel grades have advanced as a rule on buying by dealers. Consumers of heavy melting steel in eastern Ohio, nevertheless, are trying to buy scrap at $20 to $21 delivered, and are finding it hard to place orders. The same can be said for dealers who are covering old orders. Local mills have not taken tonnages of heavy steel in the past few days.

The market is exceedingly strong, but a feeling that profit taking by holders of long stocks will shortly take place has cropped out in several instances, although no indication of an arresting of the upward march of pig iron has come to the surface.

Considerable talk is going the rounds about the proposed increase in railroad demurrage rates, which dealers in scrap will oppose to the last stand. Some see nothing short of a possible financial ruin ahead if the new rates are put into effect, and the hope is that they will be suspended.

Scrap Iron Advancing

Cincinnati, Nov. 13.—Demand for steel scrap from rolling mills in this territory is gaining momentum each week. As a result, dealers are receiving better offers, which has caused prices to advance, especially since last week. Heavy melting scrap is now quoted from $17.25 to $17.75, per gross ton, f. o. b., Cincinnati, in comparison with $16 to $16.50 last week. Machine shop turnings, cast borings, and heavy turnings are plentiful and fully equal to demand. They have, therefore, been slow to advance. Cast borings are quoted from $5 to $5.50 and heavy turnings from $6.25 to $6.75, both per net ton.

Prices Advance Rapidly

St. Louis, Nov. 13.—The scrap market in this district is excited, and prices are advancing rapidly. All grades of old material offered by the railroads are bringing high figures, but the tonnages offered are unusually small, and it is a question whether current prices would obtain on a large tonnage of any grades.

Some consumers of rolling mill grades have been caught short, but they are willing to pay top market prices for all material offered. Rerolling rails are very scarce and have sold as high as $25 a gross ton. Owing to the excited condition of the pig iron market, cast iron car wheels are very much in demand, and it is predicted that they will go to $20 a gross ton before the end of the month.

Railroad offerings this week are as follows: Big Four, 2,850 tons; M., K. & T., 1,200 tons; Nashville, Chattanooga & St. Louis, 750 tons; Southern, 3,500 tons. Of the tonnage offered by the Southern railway, only 465 will come into this market.

Decided Advance

Birmingham, Ala., Nov. 13.—The old material market in the south has shown a decided advance within the past week, and some class of material is very scarce—notably old car wheels and steel scrap of all kind. Some heavy inquiries have developed for "shot" iron scrap recently. Machinery scrap, both light and heavy, is being eagerly sought while the prices of pig iron are high.

(*For complete prices see page* 1024.)

Pipe Mills Busy

And Have Orders for Delivery into Second Quarter of 1917

Pittsburgh, Nov. 14.—Pipemakers in the Greater Pittsburgh district, with few exceptions, have enough tonnage on their books to maintain present operating rates well into the second quarter of 1917. Some mills cannot promise additional tonnages until after July 1, next. Heavy demand for oil country goods continues to feature the trade. An inquiry came out a few days ago for 20 miles of 8-inch steel line pipe for shipment in West Virginia. Deliveries of boiler tubes and seamless tubing are deferred 12 months in many instances.

Another Shape Advance

Leading Eastern and Central Western Mills Asking Higher Prices—New Building Prospects not Numerous

Philadelphia, Nov. 14.—Another advance in structural shape prices now is being quoted all around by leading eastern and certain western Pennsylvania makers. The Cambria Steel Co., effective Nov. 10, raised its schedule $3 per ton or from 2.85c to 3c, Pittsburgh, this applying to first quarter specifications. Ship shapes are unchanged at 3.50c, Pittsburgh. One eastern Pennsylvania producer continues to ask 3c, Pittsburgh, for eastern and 3c, mill, for western shipment, and is getting considerable business at these bids. The western demand for shapes upon eastern mills is especially brisk. Another large eastern Pennsylvania maker has raised its special sections $1, or from 2.85c to 2.90c, Pittsburgh. Eastern mills usually make first quarter the limit on any sales today.

Though new building jobs of any size are few, the demand for shapes from miscellaneous sources, including export, is very good. Car builders have been closing for some round tonnages of shapes. Deliveries still are far extended in the east. On the 45,000-ton inquiry from France, the mills have been asked to extend their prices for a few days.

Railroads Contracting

New York, Nov. 14.—Railroad contracts for structural work, aggregating from 15,000 to 20,000 tons, have fallen within the week and have illustrated the increasing demands of these buyers which, it is expected, will bring out further large tonnages during the winter. Some of this work cannot be delivered under one year, in view of mill and shop conditions and this fact is not deterring the placing of liberal orders. The most important week's contracts included 7,000 tons for the New Haven, 3,300 tons for the Maine Central and 2,500 tons for the Pennsylvania railroads. The Lehigh Valley has inquired for 4,000 to 5,000 tons and other roads are preparing important budgets. Other structural lettings make a better showing in tonnage in eastern territory. Apparently as much work is coming out as shops can handle in view of plain material limitations. Some shapemakers now are quoting 3c, Pittsburgh, 2.80c, still may be done and the market may be quoted at from 2.969c to 3.169c, New York.

Structural Mills Busy

Pittsburgh, Nov. 14. — Demand for structural material is heavier than it has been in several months. Fabricating shops are operating at maximum capacity and many of them are buying material from warehouses, being unable to obtain satisfactory deliveries from the mills. Structural shapes are quoted at 2.80c for delivery at the convenience of the manufacturer, but most makers virtually have withdrawn from the market.

Railroads Best Buyers

Chicago, Nov. 14.—Present high prices and deferred deliveries have practically limited buying of structural shapes for use in mercantile and office buildings, and tonnages of importance placed in the west consist almost entirely of railroad and industrial requirements. It is a noticeable fact that in the tonnages contracted during the past week in the west, three projects are for larger facilities in handling ore, both at the head of the lakes and at their distributing points on the lower lakes.

The largest tonnage involves 1,438 tons for bridge construction for the Great Northern railroad, which will be fabricated by the American Bridge Co. The Northern Pacific railroad has placed 1,200 tons for an ore dock extension at Duluth, with the same fabricator, and the Great Northern railroad has placed 1,100 tons addition bridge work with the Wisconsin Bridge & Iron Co.

New Public Buildings

Cleveland, Nov. 14.—It is expected that the tonnage for the new union depot, public library and new public hall will be awarded next year, but there is no prospect of any of this tonnage being placed before Jan. 1. Walker & Weeks have been selected as architects for the new library, but it is not expected that bids will be called for for a number of months. The union depot project is expected to require about 12,000 tons. It seems to be approaching a more definite stage, as the difficulty in regard to the site is being adjusted. One large independent company has served notice that it will not ship structural material longer than single car lengths. This action is due to the shortage of cars, as the double car arrangement necessitates the use of more cars than the single car plan.

CONTRACTS AWARDED

Great Northern Railroad Co., bridge tonnage for various locations, 1,438 tons, to American Bridge Co.

Northern Pacific Railroad Co., ore dock extension at Duluth, 1,200 tons, to American Bridge Co.

Great Northern Railroad Co., bridge tonnage at various locations, 1,100 tons, to Wisconsin Bridge & Iron Co.

Ford Motor Co., ore handling bridges at Detroit, 500 tons, to American Bridge Co.

Buffalo Union Furnace Co., ore handling bridges at Buffalo, 325 tons, to American Bridge Co.

The Milwaukee Electric Railway & Light Co., boiler room at Racine, Wis., 250 tons, to F. J. Green Engineering Works.

Garfield Chemical & Mfg. Co., extension to sulphuric acid plant at Garfield, Utah, 233 tons, to Kansas City Structural Steel Co.

Car floats for the New York, Pennsylvania & Norfolk Railroad at Cape Charles, Va., 600 tons, to the American Bridge Co.

Bridge for the Maine Central Railroad over the Kennebec river in Maine, 4,000 tons, to the McClintic-Marshall Co.

Office building between Broad and Fifteenth streets, Philadelphia, 750 tons, to the Guerber Engineering Co.

Building for the Joseph Dixon Crucible Co., Jersey City, 1,200 tons, to the McClintic-Marshall Co.

Pier at Fifty-seventh street, Brooklyn, for C. Kenyon Co., 600 tons, steel contract to Post & McCord and the fabrication will be done by the American Bridge Co.

Rodin studio at Fifty-seventh street and Seventh avenue, New York City, 1,100 tons, to the Hinkle Iron Works.

Broad No. 2 exchange of New York Telephone Co., New York City, 2,200 tons, steel work and erection to Eidlitz & Ross.

Building for the Kreuger Brewing Co., Newark, N. J., 300 tons, to the Chas. Goeller Construction Co.

Addition to the plant of the Driver-Harris Wire Co., Newark, N. J., 200 tons, to the Chas. Goeller Construction Co.

Superstructure for the Thames river bridge for the New York, New Haven & Hartford raiload at New London, Conn., 7,000 tons, to the American Bridge Co.

Bridge work for the Maine Central railroad at Augusta, Me., 3,300 tons, to the McClintic-Marshall Co.

Passenger station for the Central Railroad, of New Jersey, Newark, N. J., 1,200 tons, to the Phoenix Bridge Co.

Bridge work for the Southern railroad, 700 tons, to the Virginia Bridge & Iron Works.

Extensions to the Watervliet arsenal, Watervliet, N. Y., 1,000 tons, to the American Bridge Co.

Bridge work for the Pennsylvania railroad, 2,500 tons, to independent shops.

Buildings for the General Electric Co., Lynn, Mass., 300 tons to the American Bridge Co.

Building for the General Electric Co., Lynn, Mass., 750 tons, to the McClintic-Marshall Co.

New factory building for the Crown & Seal Co., Baltimore, 500 tons, to Dietrich Bros.

Power house for the Philadelphia Suburban Gas & Electric Co., Cromby, Pa., 250 tons, to the Phoenix Bridge Co.

Extension to the plant of the Carpenter Steel Co., Reading, Pa., 200 tons, to L. F. Shoemaker & Co.

CONTRACTS PENDING

Mitler apartment, New York City, 500 tons, bids being taken.

Building in Brooklyn for the Slawson-Decker Co., Brooklyn, 1,100 tons, bids being taken.

Bridge work for the Lehigh Valley railroad, 4,000 to 5,000 tons, bids being taken.

(*For complete prices see page* 1024.)

Rail Prices

Have Been Advanced $5 for Delivery Year After Next

New York, Nov. 15. (By wire.)—The expected rail advance of $5 for 1918 delivery was officially announced today by the Steel Corporation. This places bessemer at $38, mill, and open-hearth at $40. Independents here have adopted the same prices. It now is probable that there will be liberal buying, since many roads have been in the market, but mills have held them off, pending the settlement of new prices.

Heavy rail inquiries are appearing for export. An important new one just put out calls for 75-pound sections, British specification, for 1,000 miles of track. It is estimated that this will require from 110,000 to 120,000 tons. A new inquiry for 75,000 tons for France is pending.

Heavy car buying is maintained. New orders of the week total 7,000 to 8,000 and include: Illinois Central, 1,000 gondolas to the Haskell & Barker Car Co., 1,000 gondolas to the Pullman Co., 400 ballast to the American Car & Foundry Co.; Detroit, Toledo & Ironton, 400 automobile to the American Car & Foundry Co.; Santa Fe, 500 stock to the Haskell & Barker Car Co.; Santa Fe, 500 tank, Northern Pacific, 250 ore, Chesapeake & Ohio, 300 to 500 gondola repairs, and 120 box car repairs, all to the Pressed Steel Car Co.; Soo line, 800 box and 200 automobile to the Haskell & Barker Car Co.; Baltimore & Ohio, 480 box car bodies to the American Car & Foundry Co. and 500 box car repairs to the Mount Vernon Car Mfg. Co.; Southern, 1,500 to 1,700 wooden types in its own shops; Nickel Plate, 150 center construction to the Pressed Steel Car Co.

New inquiries include: New York Central, 1,000 composite gondolas; Great Northern, 2,000 box, 1,000 refrigerator; Clark Car Co., 500 gondolas; Baltimore & Ohio, 350 box.

Highest Wage

Ever Received by Puddlers Insured by Examination

The bi-monthly examination of sales sheets of representative bar iron concerns working under the wage scales of the Amalgamated Association of Iron, Steel and Tin Workers last Saturday developed a 2-cent card rate, entitling puddlers to $9.55 a ton for boiling, by far the highest rate in the history of the craft in America. During September and December, 1864, a rate as high as $9 a ton prevailed. It is not known what wage rates will prevail after the 2-cent card is passed, since the published wage scales make no provision for wage increases after the 2-cent card is reached.

The examination of sales sheets of Nos. 26, 27 and 28 gage plain steel sheets developed an average price of 2.75c, or one point above the last previous average price. Sheet mill employes now are receiving 18 per cent above base rates. An average price of $4.10, base, was developed by the examination of sales sheets of tin plate makers. Tin plate mill employes now are receiving 12 per cent above base rates.

Higher Rates

Authorized by Commission, But Not as High as Proposed

Washington, Nov. 15. (By wire.)—The interstate commerce commission entered an order late yesterday granting transcontinental railroads authority to cancel protested and suspended tariffs, increasing rates on iron and steel from the east to the Pacific coast and intermediate points. The tariffs would have increased the rate of 55 cents per 100 pounds from Chicago, 65 cents from Pittsburgh, and 75 cents from New York to the coast, to 94 cents.

E. T. HENDEE

Carriers are authorized by the order to put in substitute tariff increasing the carload rate on iron and steel 10 cents per 100 pounds and on less than carload rate 25 cents per 100 pounds. The new schedules, effective Dec. 30, give Chicago a rate of 65 cents, Pittsburgh 75 cents and New York 85 cents on carloads. Similar advances are to apply from the Missouri river.

(*For complete prices see page* 1024.)

Death of Edward Thomas Hendee

Edward Thomas Hendee, secretary of Joseph T. Ryerson & Son, Chicago, and one of the ablest men in the country in his line of activity in the iron and steel and machinery business, died Sunday, Nov. 12, at Minneapolis, where he had gone on a business trip. The burial was at Claremont, N. H., his birthplace, Tuesday afternoon.

Mr. Hendee was born Feb. 22, 1880, and graduated from New York University in 1900 with the degree of B.S. He afterward received the degrees of M.E. and M.S. from his alma mater, and the degree of Sc.D. at Columbia University in 1901. From 1901 to 1902, he was assistant professor of mechanical engineering at New York University. In 1902, he became associated with Joseph T. Ryerson & Son as advertising manager. He built up and became manager of the machinery department, and was made assistant to the president in 1911. In 1913, he assumed charge of the railway supply department of the firm. He was also elected secretary of the company in 1913 and continued in that position until his death. Under his able leadership, both the domestic and foreign machinery business and railway supply business of the company were very widely extended. Mr. Hendee was vice president and director of the Lennox Machine Co. and director of the American Glyco-Metal Co.

Mr. Hendee was a member of the American Society of Mechanical Engineers, Sons of the Revolution, the Masons and a number of clubs. In college he was a member of the Zeta Psi Fraternity. He was married Oct. 12, 1907, and is survived by a widow and two sons.

Mr. Hendee was a man of striking personality. He was enthusiastic and his enthusiasm was contagious. His energy was indefatigable and his loyalty to his company and to his friends was a prominent factor of his character.

Making Progress

Informal reports are to the effect that the negotiations for the sale of the Thomas Iron Co., Easton, Pa., to a syndicate headed by Philadelphia bankers at an offer of $3,500,000, are progressing favorably.

Three Killed.—An accidental explosion of gas while furnace A of the Warwick Iron & Steel Co., Pottstown, Pa., was undergoing repairs, Nov. 11, resulted in the death of three men.

Eight Hour Day is Discussed

At Convention of National Founders' Association—President Barr Quotes From Government Census in Support of His Position

THE convention of the National Founders' Association was opened in New York Wednesday morning.

President William H. Barr, in his annual report, reviewed briefly the history of the association, telling of its early efforts to carry on collective bargaining. This proved impossible with the iron molders' union, which made a reputation for lawlessness and violence and, through its policies of restriction of output and antagonism to the installation of molding machines and foundry apparatus, discouraged incentive in that field. He told of the efforts of the association to promote safety and sanitation, and said that it hopes to inaugurate a system of physical examination to safeguard employes against their own ailments and help them to improve their health and efficiency. He said that the most important development of the year was the formation of the conference board, referred to at length on page 1010 this issue of *The Iron Trade Review*.

Mr. Barr discussed at some length the eight-hour day, and said that investigation made by the United States government in 1904 demonstrated that the shorter working day increases the cost of manufacture and reduces the output.

"Politicians generally," said Mr. Barr, "have petted organized labor until now it regards itself as the privileged class in this country. A large number of its lobbyists are found in the halls of congress, while a single representative of business interests is still branded and considered as an 'insidious' offender.

"Public service corporations, bankers and business men are requesting relief from the existence of the Clayton law; exporters of various commodities have asked for relief from the Sherman anti-trust law in its application to foreign trade; numerous protests against proposed laws, and petitions for relief from existing ones are sufficient evidence of the general business situation regardless of the prosperity that is evident on the part of those organizations manufacturing war munitions."

Mr. Barr quoted from statistics of the bureau of the census, showing that in 275,793 establishments in the United States there are more than 7,000,000 wage earners and nearly 1,000,000 salaried employes, and that the capital employed is nearly $23,000,000,000.

"Consider these figures," said Mr. Barr, and realize the importance of the manufacturing industry of the United States. Realize the value of manufacturing to the wage earners, and realize again the fact that the owners of that $23,000,000,000 of capital are entitled to some consideration under the law. What is the answer to the activities of labor and to the subservience of congress to labor during the past year? The answer, gentlemen, is to study that report of the bureau of census, to realize your power for organization, to act patriotically for the good of the whole country and to demand the rights which are granted you by the constitution of the United States.

"It was never intended that this country should be directed and dominated by the leaders of less than 2,000,000 workers out of a total of 30,000,000, nor was it intended that the men and women who invested

(*Continued on page 990.*)

Picketing Banned in California

Picketing before open shops, that pernicious abuse of employers by striking employes, has been forbidden in San Francisco. By a vote of 66,743 against 63,407, the unorganized workingman has been granted protection to work where he can find a job, regardless of unions, and the customers of the place are assured against the annoyance of pickets stationed outside a shop with their cry of "Please do not patronize this house; it is unfair to organized labor!", etc.

The vote was very close and feeling was high in San Francisco. The question had been emphasized during the summer by the strike of waiters and restaurant-workers in the justly famous restaurants of San Francisco. A visitor to the city would see a couple of scrubby-looking men in front of nearly every restaurant in the city. These men wore red badges and paced up and down before the door, telling patrons what an "unfair house" the establishment was. One hungry tourist exclaimed, "I wonder where they expect us to eat; practically every restaurant is picketed."

That is over now, and the law and order committee of the chamber of commerce has won a notable victory. This organization of business men had grown tired of seeing the city held back in its development by the excesses of organized labor, and had raised a large fund to support the open shop. The voting on the amendment to prohibit picketing was entirely separate from opinions on the presidency; while Wilson carried San Francisco by 15,000, the vote to stop picketing received only 3,000 majority; and incidentally, it may be mentioned that the city gave a tremendous majority against prohibition.

The decision on picketing was a direct issue between employers and unorganized labor against organized labor; since the employers won, it is assumed that some union members, doubtless disgusted at abuses of union measures, voted in favor of stopping picketing. It is expected that some trouble will be encountered in curbing the unions to comply with the new law, but prompt and effective measures will be taken.

Many Millions of Dollars

Are Being Paid by England for American Products—Financial Aspect of British is Encouraging

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Nov. 3, 1916.

A few days ago we had an assurance from Mr. McKenna that "we have had no difficulty in financing ourselves and our allies up to the present, and I see no reason to expect any difficulty in the future". Mr. McKenna mentioned the interesting fact that every working day £2,000,000 has to be raised to meet obligations in America. The latest issue of bonds, sold to the extent of £36,000,000 in a fortnight, in spite of the fact that this is not the best time for raising a loan. How the money forwarded to America is spent is shown by the report reaching here of American exports which in August reached the record total of £102,000,000, compared with £52,000,000 in the corresponding month of 1915. We appreciate the fact that four-fifths of these exports went to Europe in the shape of war materials and foodstuffs, the United Kingdom alone receiving goods to the value of £32,000,000, or over a million a day. Every week brings further government control, and this week we have had maximum prices for coal fixed by the government, for shipment to France and Italy, and in another direction we are feeling the social effect of government control in an order to shut up all shops from Monday next not later than 8 o'clock in the evening. This may be regarded as a sort of modern equivalent to the ancient curfew. The earnings of workpeople are constantly increasing.

Pig Iron

The pig iron industry is showing peculiar irregularities. In Cleveland very active buying has been reported this week, chiefly in foundry irons. This is partly due to the fact that the authorities have sanctioned the sending of iron to Scotland to the end of November, and Scotch consumers have been buying rather keenly. Recently there was a tendency to shade prices for foundry iron, but this has passed away. Outside Scotland, movements of iron are restricted to the allies. The shipments for October so far amount to about 30,000 tons, and stock has been reduced by over 8,000 tons. This leaves the amount in store at less than 6,000 tons, as compared with 134,000 tons a year ago. It is clear that this stored iron will soon reach the vanishing point. The position is rather different in the Midland district, where the buying of forge iron has been for some time so slow that within the past few weeks makers of Northamptonshire and Derbyshire forge material have been competing for business.

Finished Materials

Steel production is almost wholly for war requirements, the government discouraging the granting of permits to everything unable to show its connection more or less directly with the war. The demand is extraordinary, but there is for the moment no expectation of increased prices. Some months ago, it was expected that prices would be revised by the ministry of munitions in the autumn. So far, nothing has been said about this, and it seems to be assumed that no alterations will take place. A few cautious dealers, however, are inserting a clause insuring the application of advanced prices, if before the execution of the order these should be introduced by the ministry of munitions. It is remarkable how little American steel seems to be coming through. A few quotations were available yesterday of American billets for delivery at British ports, at prices ranging from £15 to £15 10s. Apparently the earliest promise of delivery is two months hence, and this does not appeal to British buyers under present circumstances.

Galvanized sheets are not much called for at the present high prices, and English makers fully realize that, for the present, the international business in this line has been captured by America. Both in galvanized sheets and tinplates, a stern fight for business after the war is looked for. For the small amount of tinplate business available, quotations vary somewhat widely.

May Lease Texas Furnace

A. D. Clark, of Dallas, president of the Jefferson Northwestern railroad, and associates, have opened negotiations with Governor James E. Ferguson, of Texas, looking to the purchase or lease of the state's iron industry at Rusk, including the ore beds that are situated adjacent thereto. The property at Rusk embraces a furnace and foundry which have been idle for some time on account of the unprofitableness of their operation by the state, although convict labor was used. The pending transaction also involves the purchase of the state railroad which runs from Rusk to Palestine. It is reported that if the deal is consummated, a railroad will be constructed between Rusk and Jefferson, a distance of about 90 miles, to connect the other two lines. The Jefferson Northwestern runs from Jefferson to Dalton, about 50 miles, and has a branch line from Lanier to Linden. It traverses the heart of the iron ore region of Marion and Cass counties. Under an act of the legislature, the governor has authority to sell or lease the state's iron industry and railroad.

Many Engineers

Witness Maneuvers of Submarines and Inspect Plant

Over 800 members of the American Society of Mechanical Engineers attested their interest in peace and preparedness by journeying to New London, Conn., last Saturday to witneses special submarine maneuvers and inspect the manufacture of diesel engines at the plant of the New London Ship & Engine Building Co., Groton, Conn. The party assembled from New York, Boston, Providence, Worcester and other eastern cities. Special trains were run from New York and New Haven. The submarine maneuvers were held specially for the visiting engineers, through the courtesy of Rear Admiral A. W. Grant, commander of the submarine forces of the United States. Six undersea boats took part. The submarine tenders BUSHNEL and FULTON and the quartermaster department tender GENERAL GREENE were placed at the disposal of the visitors for the trip out into the sound.

The inspection of the New London Ship & Engine Building Co.'s plant included the 150 x 600-foot machine shop, the gray-iron foundry and the bronze foundry operated by the Vanadium Metals Co., Pittsburgh. At the latter plant, vanadium bronze castings up to 5,000 pounds in weight are turned out. Diesel engines for submarine and commercial service were seen in operation in the erecting bays in the machine shop.

Previous to the excursion, a luncheon was held at the Mohican hotel, New London. On Tuesday evening, Nov. 14, Chas. H. Bedell, electrical engineer, Electric Boat Co., Groton, Conn., delivered an illustrated lecture on submarines under the auspices of the American Society of Mechanical Engineers. The lecture was given in the Engineering Societies building, New York City.

Eight-Hour Day Discussed

(*Continued from page* 988)

their money in industrial development should be deprived of their rights. You may rest assured, however, that until you take definite and effective action to conserve these rights, they will amount to nothing. The political inactivity of the business man who, possessing wonderful capabilities, permit themselves to be tied up by personal affairs so as to fail in sustaining their rights by the presentation of the most simple facts to their state and national representatives, is well known. The developments of the past year, politically and industrially, emphasize as never before the need of more comprehensive co-operative action in the industry."

Spot Coke High

Market at Pittsburgh Quiet But Strong —Production Increased

Pittsburgh, Nov. 14.—The embargo declared by the Pennsylvania Lines West on Monday does not affect the movement of coke. The market for Connellsville fuel has been rather quiet this week, but prices have been well maintained. Spot furnace coke is being held at from $7.50 to $8 a ton at the ovens. Seventy-two hour fuel has taken a spurt and has sold at as high as $10 a ton at the ovens, with reports of sales at as high as $11, ovens. The contract market is comparatively quiet. Some cupola coke has commanded as high as $6.50 a ton for delivery the first half of 1917, but at least one cokemaker still is offering fuel on the basis of $5, ovens. *The Connellsville Courier* for the week ending Nov. 4, says production was 408,282 tons, compared with 398,096 tons the week before.

Spot Foundry Sold at $9.50

Philadelphia, Nov. 14.—A sale of 50 cars of spot Connellsville furnace coke was made in this territory the past week at $7.50, ovens. Spot foundry coke has been sold at $9.50, Connellsville ovens, in this territory, and $10 has been quoted. Foundry coke of an inferior grade has been offered for a 9-months' contract at $6.50, ovens. Some eastern Pennsylvania furnaces still are being kept banked because of shortages of coke and others about to blow in have been held idle for the same reason.

Extraordinary Prices

New York, Nov. 14. — Remarkable prices on local by-product foundry coke again are appearing in New England as the result of an embargo placed on shipments of this fuel by the New Haven railroad. Spot coke this week brought $15, delivered, and the indications are the $16 and higher prices of last spring, when a similar embargo situation prevailed, may be duplicated. Connellsville foundry coke by Boston & Maine delivery has been offered this week at $11, delivered.

Asks $9.25 for Prompt

Cleveland, Nov. 14.—Deliveries of coke are very slow, owing to the car shortage, and one company is asking $9.25 for prompt foundry grades. Sales as high as that have not been announced, but more than $8 has been paid in some cases.

Scarce at Cincinnati

Cincinnati, Nov. 13.—Very little change can be noted in the coke situation. No furnace coke for contract shipment is available either from Wise County, Pocahontas or New River districts. Spot furnace coke is bringing almost any price, depending upon conditions surrounding each sale. Recently it has been sold in small lots around $8, ovens. Foundry coke from these districts for contract shipment is quoted from $5 to $5, ovens. The decided shortage of coke is still noticeable because operators are showing strong preference toward selling coal direct, instead of turning it into coke, because of the high price now obtainable for the former.

By-Product Coke

St. Louis, Nov. 13.—The inquiry for 10,000 tons of smelter coke, reported from this market last week, has not been closed. Coke is in great demand, inquiries coming even from Indiana for by-product coke, which have been turned down because the supply far exceeds the demand. Connellsville foundry grades are held here at $9 to $10 a ton, f. o. b. ovens, and by-product foundry at $10 to $11 and by-product furnace at $9 to $10 a ton.

The blast furnace which the Republic Iron & Steel Co. is building at Youngstown, O., will be completed by Jan. 1 and will be blown in immediately.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, Nov. 14.—The continued active demand for copper, coupled with the growing scarcity of this metal, has had a pronounced effect on prices. This is particularly noted in electrolytic copper, which is about sold up for the next five months. Some producers are nearly sold out for the entire first half of next year. Lake copper also is well sold ahead but the scarcity is not so pronounced as in electrolytic. Casting copper is sold up in a good many cases for the rest of this year. The biggest demand of late has come from domestic brass mills, some of whom appear to be short; there also has been considerable demand from private buyers abroad. Electrolytic now is quoted as follows: November and December, 32c to 32.50c, cash; January and February, 31.50c, delivered 30 days; March, 31c, delivered 30 days; second quarter 30.50c, delivered 30 days; third quarter, 29.50c to 30c, delivered 30 days. Medium quality lake copper is quoted as follows: November and December, 31c to 31.50c, delivered 30 days; first quarter, 29.50c, delivered 30 days. Ordinary casting copper is quoted at 29c to 29.50c, cash, for November and 28.75c to 29.25c cash, for December and January.

The tin market has been characterized by a fair demand all along and yesterday considerable excitement developed, all offerings being taken. The same activity prevailed today, inquiries for spot and futures involving at least 400 tons, and actual business totaling about 300 tons. Present demand is due largely to fears over the statistical situation, since permits for exporting the metal from Great Britain and the Straits continue to be secured with difficulty, with the result that stocks on hand in this country are expected to show another reduction at the end of November. London limits involve comparatively small tonnages. As a result of the excited situation, prices are advancing rapidly. Spot, which sold yesterday at 43.87½c, today is selling at 44.45c and 44.50c, and November is held at the same range. December arrival is quoted at 44.25c; January arrival at 44.12½c, etc. March and April shipments from the Straits are quoted at 43.50c, c. i. f. New York, with very little offering.

Spelter has been sold in fairly large tonnages, although the market at no time during the week could be called active. The output is well sold ahead and prompt spelter actually is scarce. Brass special has been in better demand lately with the result this grade is as scarce as prime western, and the premium for brass special now is in the neighborhood of ¾ to 1c above the prime western price. Prime western is quoted as follows: Prompt and November, 11.25c to 11.37½c, St. Louis; December, 11.12½c to 11.25c; first quarter 11c to 11.12½c; second quarter, 10.50c.

Demand for lead continues dull but this metal is well sold ahead and prices remain stable. The American Smelting & Refining Co. continues to quote 7c, New York, and the outside market is quoted at 6.85c to 6.90c, St. Louis, and 7c, New York.

Buying of prompt and nearby aluminum is quiet and sellers find it difficult to obtain the prices which recently have been asked. These are as follows on carload lots: No. 1, virgin ingots 63c to 64c; No. 1 remelted 58c to 60c; No. 12 alloy 45c to 47c.

Demand for antimony is inactive. Second hands offer spot at around 13c, duty paid, and November and December shipment from the far east at 11.50c to 12c, in bond. First hands hold for higher prices on futures and, in some cases, on spot.

(*For complete prices see page* 1024.)

Problems in D. C. Motor Control

The Operation of Mechanically Connected, Direct-Current Motors Permanently in Series or Parallel Presents Some Unique Problems in Design of Control Apparatus

BY H. F. STRATTON

IN THIS paper, reference will frequently be made to two or more motors mechanically connected. The phrase "mechanically connected" will be defined as meaning first, that any change in speed of rotation of any one motor must be accompanied by the same proportionate change in speed of rotation of each of the other motors, and second, that a change in the direction of rotation of any motor must be accompanied by a change in direction of rotation of each of the other motors.

This definition is made broad enough

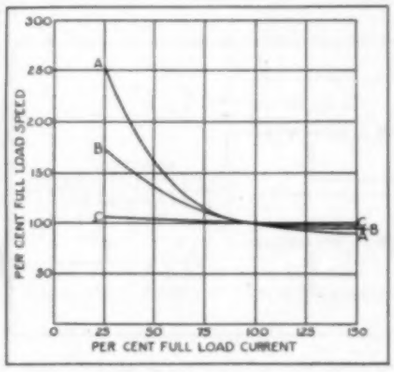


FIG. 1 — RELATION BETWEEN SPEED AND CURRENT IN A COMMON SERIES MOTOR

to include the infrequent cases where two or more motors of different horsepowers and speeds are operating together to drive one motion, and the more frequent cases where the motors may be identical in horsepower and speed but may rotate in opposite directions. The majority of cases claiming our attention will include two or more motors of the same horsepower and speed, all rotating in the same direction at the same time. The mechanical connection between motors may consist of gearing, pulleys and belts, sheaves and cables, or it may be through track and track-wheels as on the bridge motion of a traveling crane.

Electric cars furnish an early example of two motors mechanically connected. One reason for their use in this work is the small clearance between the track and the bottom of the car; another reason is the economy in power consumption which is gained by the use of series-parallel control. The steel mills furnish frequent illustrations of two or more mechanically connected motors, and it is logical to inquire why preference is given to several mechanically connected motors instead of one large motor having a horsepower rating equivalent to the sum of the smaller motors.

A paper presented at the Philadelphia meeting of the Association of Iron and Steel Electrical Engineers, Nov. 4, 1916. The author is general manager of the Electric Controller & Mfg. Co., Cleveland, O.

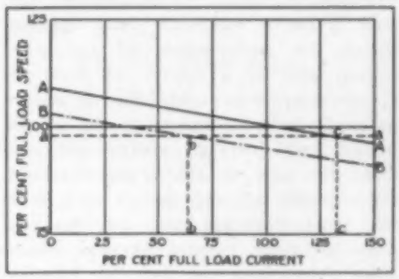


FIG. 2 — RELATION BETWEEN SPEED AND CURRENT—SHUNT MOTOR

Advantages of Mechanically Connected Motors

In some cases, two or more motors were used simply because of their convenience. It may be that the frame of the smaller motors fitted more easily in the available space or that it appeared to be considerably easier to change armatures. Sometimes the horsepower requirements are quite large, and if one large motor instead of several small ones, were used, it might introduce into the mill an entirely new size of motor, thereby complicating the spare part situation; or the horsepower rating might be beyond the range of mill-type motors, thereby forcing the use of a motor which did not seem to have the same sturdy qualities that characterize mill-type motors.

Another reason, and a very good one, for the use of two or more mechanically connected motors, is the need of continuing to operate some machine, even if one of the motors burns out. In this case the remaining motor, or motors, are made of sufficient capacity to maintain operation, although perhaps at a reduced speed. A metal mixer is a good illustration of a machine coming under this classification, as it is obviously

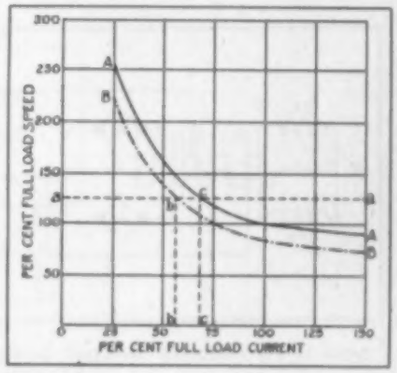


FIG. 4—UNBALANCING CONDITIONS IN TWO MECHANICALLY CONNECTED SERIES MOTORS

necessary to be able to tilt the mixer even if one motor is disabled. The hoist on a ladle crane is another common illustration of the same character.

It has come to my attention several times that two or more mechanically connected motors have been selected for roller table service on the theory that the small motors will accelerate and reverse more rapidly than one large motor, and that therefore a roller table so equipped, has a larger capacity to move steel. Probably this belief was based on the fact that so far as mill-type motors are concerned, the moment of inertia generally increases a little more rapidly than the horsepower rating. For instance, the moment of inertia of the armature of a 25-horsepower motor is apt to be less than one-half the moment of inertia of the armature of a 50-horsepower motor. There is an error or omission in this reasoning to which I shall refer later.

I have also heard of the use of two mechanically connected motors perma-

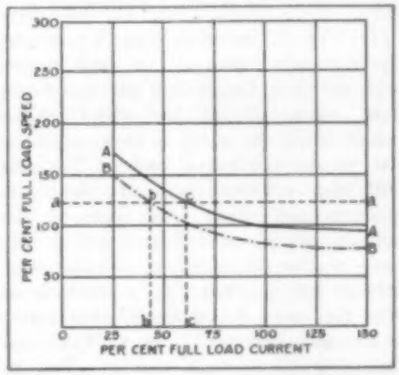


FIG. 3—UNBALANCING CONDITIONS IN TWO MECHANICALLY CONNECTED COMPOUND MOTORS

nently in series, advocated for roller table service on the theory that acceleration or reversal was as rapid up to half speed as in the case of one or more motors receiving full line voltage, but with the added advantage that the two motors in series did not have the same tendency to race if allowed to run for a length of time. It was felt that this made reversing quicker and easier for the motors. I have also known cases where steel mill engineers have felt that there should be a worth while saving in the cost of the controller for two motors mechanically connected and permanently in series.

Some of the Difficulties Encountered

The foregoing illustrations are those which have come to my attention from time to time favoring the use of two or more mechanically connected motors in the place of one large motor, and no doubt other reasons could be stated. This practice, however, has raised new difficulties, some of which can easily be explained by theoretical considerations; others, however, are brought to our attention forcibly only by the difficulties experienced in service and some times it is puzzling to find the true explanation of the difficulties which have developed. The electrical problems, which are very largely the questions of circulating currents and the unequal division of the total motor current, are important and will be considered first.

The following is the general equation of a direct current motor: The speed of rotation is equal to the voltage divided by the product of the number of effective armature conductors and the amount of magnetic flux which is cut by these conductors. The characteristic curves of series, shunt, and compound motors are merely graphic illustrations of this fundamental equation bringing in, in addition, the variation of motor current as a function of speed and the variation of torque as a function of current. It will be more in line with our purpose to show curves for series, shunt and compound motors, illustrating the change in motor current with change in speed. It is, of course, well known that the speed changes least in the case of shunt motors, more in the case of compound motors, and most in the case of series motors.

In Fig. 1, curve *AA* represents the relation between speed and current in the case of a series motor, *BB* in the case of a compound motor, and *CC* in the case of a shunt motor. These are curves expressing current as a function of speed. It must be remembered that such a curve represents only approximately the performance of any given motor, and as a matter of fact, the speed-current curves of different motors, although built commercially to be duplicates, will vary by several per cent. Take the case of any standard motor. Undoubtedly all such motors built from the same drawings and patterns will have the same general physical dimensions, the same number of effective armature conductors, and the same number of turns in the field coils. It must be remembered however, that the position of the speed-current curve is strongly affected by the total flux which is cut by the armature conductors. In each case the voltage may be the same, the armature and the field coils may be the same, but the total flux may vary considerably, because the reluctance of the iron circuit of the motor will depend on the character of iron employed and upon the lengths of the several air gaps.

Danger of Heavy Unbalancing

In Fig. 2, the full line *AA* is the speed-current curve of one shunt motor, and the dash line *BB* is the speed-current curve of another shunt motor which might be easily sold as a duplicate of the first named motor. The only difference between these two curves is that at any given load, one of the motors has a speed 5 per cent in excess of the other motor. If two such motors are connected to a machine so that they must rotate at the same speed, there will necessarily be a heavy unbalancing of the total current. For instance, assume the load is such that the two motors will run at the speed indicated by the line *aa;* it will be seen from the diagram that one motor will then take 65 per cent full load current and the other motor 135 per cent full load current. The two motors together are taking twice the full load current of one motor, but one motor is considerably underloaded and the other motor so much overloaded that it will burn out if the load is maintained.

Divide Load Unequally

Fig. 3 indicates the conditions which might be expected in the case of compound motors and Fig. 4, the conditions in the case of series motors. It will be noted that the unbalancing of mechanically connected series motors will be less than the unbalancing of either shunt or compound motors. The unbalancing of compound and series motors is least at high speed and low current and greatest at low speeds and high current.

So far we have not considered the question of control, but have merely reached the conclusion that, due to imperfections in motor manufacture, two or more mechanically connected motors are apt to divide the load unequally, and that this difficulty is least serious with series motors, more serious with compound motors, and most serious with shunt motors. Several other causes might lead to similar variations in the speed-current curves. Unequal heating of shunt field coils, failure to rewind armature or field coils with the original number of turns, poor condition of commutator or brushes, or greater drop in line voltage in leads to one motor than in leads to another motor, are examples of these causes. In short, there are many reasons why two or more mechanically connected motors, nominally duplicates, will make an unequal division of the total motor current.

Two series motors are sometimes controled by a single, standard, one-motor controller by connecting the two series field permanently in parallel and the two armatures permanently in parallel. Fig. 5 represents such a condition wherein FF_1 is the series field of one motor, SF_2 is the series field of the other motor, A_1 is the armature of one motor, A_2 is the

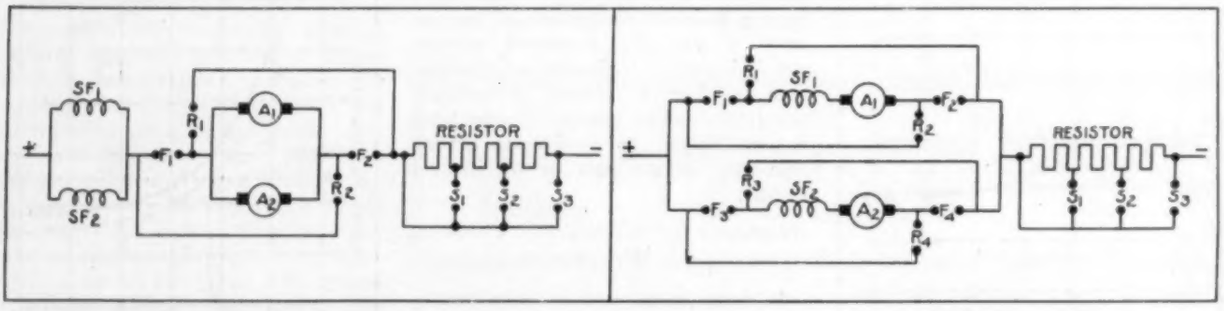


FIG. 5—TWO SERIES MOTORS CONTROLED BY A SINGLE CONTROLLER. FIG. 6—MOTORS CONTROLED WITH ONE STARTING SWITCH AND INDIVIDUAL REVERSING SWITCHES

armature of the other motor, F_1 and F_2 are one pair of reversing contactors, and R_1 and R_2 are the other pair of reversing contactors. S_1, S_2 and S_3 are the acceleration contactors which are used for short-circuiting the resistor. The entire motor current flows through the two series fields in parallel, which are of relatively low resistance; as the current will divide inversely as the resistance of the two fields, it is a delicate and difficult matter to balance these two circuits so that they shall divide the current equally, not only when the motors are cold but also when they are hot. The general result is that more current flows through the series field of one motor than through the series field of the other motor. The motor having the smaller portion of current through its series field will have less total flux to be cut by the armature conductors; it will therefore develop less counter-electromotive force than the other motor, and will permit a considerably higher current to pass through its armature. This connection eliminates the unbalancing due to unequal division of current through the series field, as explained in connection with Fig. 5. It is a satisfactory connection for two mechanically connected series motors when these motors are merely started from rest and accelerated to receive full line voltage. The only unbalancing of load is that due to variations in the speed-current characteristics of the two motors.

Will Not Stand Plugging

I have said that the connections in Fig. 6 are satisfactory for accelerating the motors from rest to full speed. They are not satisfactory for rapid reversing or "plugging", the difficulty being one of circulating currents at the moment of reversing.

Fig. 7 indicates two mechanically connected motors operated by this scheme of control and receiving full line voltage. The current passing through the series field and the armature of each of the armatures may be looked upon as a booster assisting the line voltage to force current through its series field. The counter-electromotive force of one motor will probably be at least slightly greater than the counter-electromotive force of the other motor. For illustration, assume 250 and 240 volts for the top and bottom motors respectively. With this condition more current will pass through the series field of the top motor than through the series field of the bottom motor. The effect of this will be to further increase the counter-electromotive force of the top motor and further decrease that of the bottom motor. The fields become still further unbalanced, and presently, due to the predominance of the top motor, a local current circulates through the series field and armatures of the two motors, reversing the series field of the bottom motor. As soon as this is reversed, the direction of the counter-electromotive force of the bottom motor is reversed, and we then have two series generators

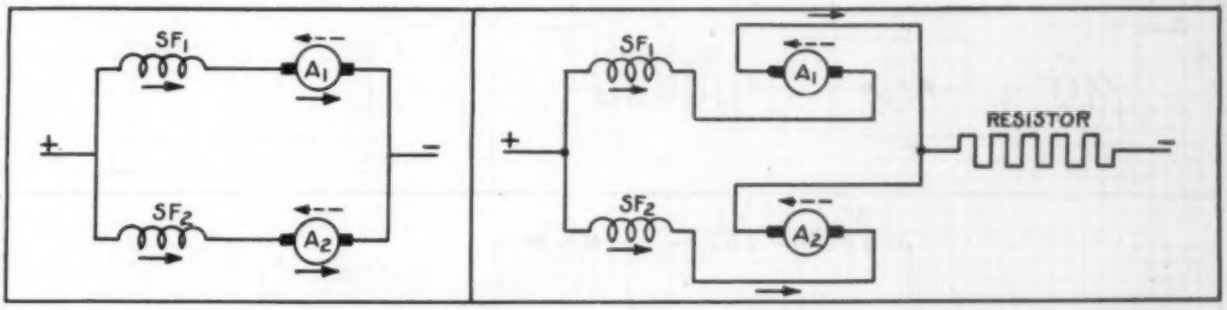


FIG. 7—POSSIBILITY OF CIRCULATING CURRENTS AT MOMENT OF REVERSING WHEN MOTORS ARE CONNECTED AS IN FIG. 6. FIG. 8—CONNECTIONS ESTABLISHED WHEN CONTROLLER IS REVERSED WHILE MOTORS ARE RUNNING FULL SPEED

The motors, will, therefore, be unbalanced, not only because of imperfections in manufacture, as shown in Fig. 4, but, in addition and more seriously, because the total flux of one motor will be larger than the total flux of the other motor. The conclusion of this analysis is, therefore, that the operation of two mechanically connected series motors by one controller may lead to serious unbalancing of the current.

Development of Control Schemes

The first departure from this scheme of control is one probably suggested by the practice followed on electric cars. Here it is usual to employ one starting resistor, but to have individual reversing switches for each motor. These connections are shown in Fig. 6, wherein the designations are the same as in Fig. 5, with the exception that F_3, F_4, R_3 and R_4 represent an additional set of reversing contactors. With individual reversers for each motor, it is possible to connect the series field of one motor directly to its armature and the series field of the other motor directly to its armature. motor is indicated by solid arrows and the counter-electromotive force developed in each armature is opposite in direction and is indicated by the dotted arrows. Assume that these motors are running at full speed and that the controller is reversed, whereupon the connections in Fig. 8 are immediately established. The direction of current through the series field remains the same; the armatures are still rotating in the same direction, and therefore, the direction of the counter-electromotive force remains the same; but the connections between the armature and the series field of each motor have been reversed so that now the direction of the current through the series field and the direction of counter-electromotive force of each motor, are the same. The series field and the armature are connected in a closed path, of which the resistance is relatively very low. If the starting resistor is designed to allow the passage of 50 per cent overload at reversal, the counter-electromotive force developed in each armature is somewhat in excess of the line voltage. Each in series with each other generating current in the same direction with no external resistance in the circuit. The result is, of course, an amount of current which is not only inconvenient but positively dangerous. We, therefore, reach the conclusion that where only one acceleration resistor is used, it is advantageous to identify each series field with its armature in starting from rest, but that on rapid reversal these connections are dangerous, and should not be employed.

Preventing Circulating Currents

The circulating currents described are prevented by employing the connections shown in Fig. 9. This differs from Fig. 8 only by having an individual acceleration resistor for each motor. The local path through which the circulating currents flowed has now been made to include such high total resistance that the circulating currents cannot get started and with these connections, rapid reversal is smooth and normal.

This analysis might be expanded almost indefinitely by investigating other

more complicated methods of control, such as dynamic braking hoist controllers, armature shunts, etc. I will have to dismiss this additional subject with the statement that the more complicated forms of control contain even greater dangers of unbalanced loading and circulating currents.

Climax of Control Schemes

Fig. 9 which has been reached by the elimination of all the previous diagrams, is, in my judgment, the only satisfactory way to control two or more mechanically connected motors permanently in parallel. This diagram represents in reality, a controller for each motor. In order that the controllers should function simultaneously, it is preferable to use two-pole contactors for two motors, three-pole contactors for three motors, etc. This assures that all important circuit changes, such as reversal or short-circuiting portions of the acceleration resistors, shall occur at the same time in each motor circuit.

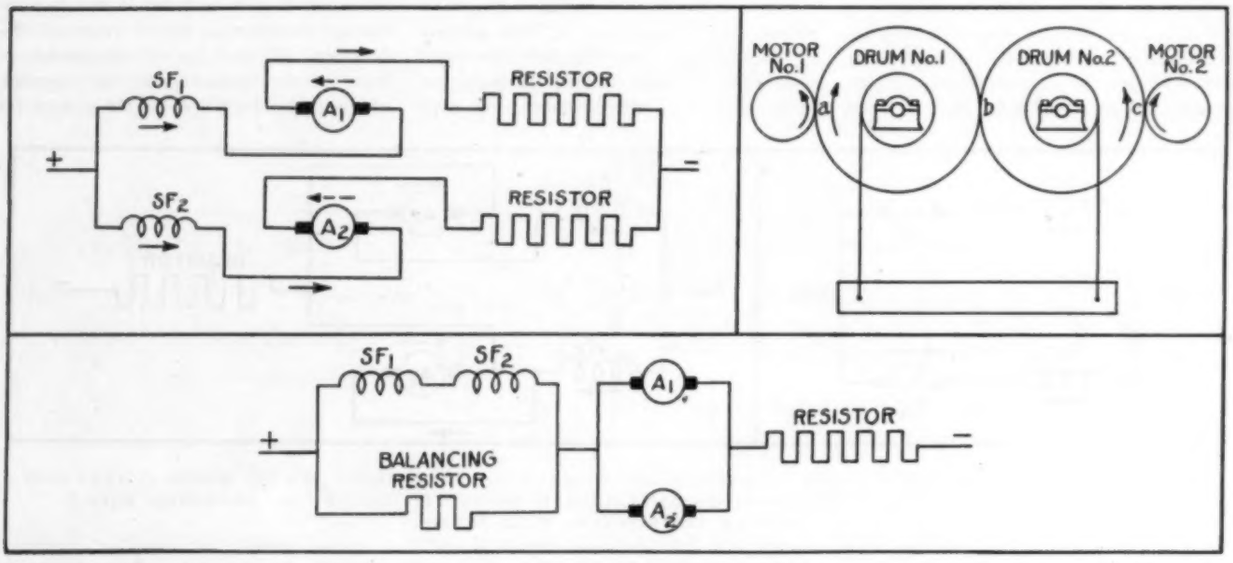


FIG. 9—CONNECTIONS WHICH ELIMINATE CIRCULATING CURRENTS. FIG. 10—AN EXAMPLE OF UNBALANCING OF BRAKING EFFORT. FIG. 11—SCHEME OF CONTROLING TWO MOTORS WITH ONE SET OF REVERSERS AND ONE ACCELERATING RESISTOR

Fig. 10 represents an interesting example of unbalancing, not of current, but of braking effort. This represents diagrammatically the hoist of a ladle crane, with the motors No. 1 and No. 2 permanently in parallel and geared, as indicated, to the hoisting drums No. 1 and No. 2. Each motor was equipped with a magnetic brake, but, due probably to unequal adjustment, one brake would act more quickly than the other after the cessation of current through its coil. Assume the ladle is being hoisted, in which case the motors and drums would rotate as indicated by the arrows. Suppose now that the controllers are brought to the "off" position, but that the brake on motor No. 2 locks the armature of that motor before the brake on motor No. 1 locks the armature of its motor. In this case the point *c* must remain stationary, but motor No. 1 exerts a force upward on the drum No. 1 at point *a*. This produces a downward thrust at the point *b* on drum No. 2, but as the mechanism is rigid in this direction, drum No. 2 does not move. The result is that drum No. 1 tries to rotate upward about the point *b*. The bearing caps, while of liberal proportions, were probably not designed to take an upward thrust, since it would appear that the weight of the ladle would always keep the drums resting heavily on their bearings. The final result was that the bolts holding down the bearing caps of drum No. 1, were stretched or broken. In this particular mechanism, if one brake locks before the other, there is always a tendency to lift one of the drums, no matter which brake locks first, and no matter whether the load is being hoisted or lowered. This is an actual difficulty which has occurred in several instances, and I believe has led to the use of larger cap bolts.

Generally speaking and within reasonable limits, the larger the motor, the greater will be the number of acceleration contactors employed in the controller. For instance, in rapid reversing controllers, it is common practice to employ three acceleration contactors for a 50-horsepower motor and four for a 100-horsepower motor. With two mechanically connected motors permanently in parallel, the question arises whether the number of acceleration contactors should be determined by the horsepower of the individual motors or by the total horsepower; or to put the question concretely, should three or four acceleration contactors be employed in the case of two mechanically connected 50-horsepower motors. Probably the best way to find an answer to this question is, first, to decide why we use more acceleration contactors with large motors than with small motors. One reason is to flatten out the acceleration curve so that the current peaks will not be so large. A current peak of 175 per cent on a 500-horsepower motor might cause serious line disturbance, whereas a similar overload peak of a 25-horsepower would be negligible as far as line disturbance is concerned. I think this point is more hypothetical than real in the case of the average motors employed in a steel mill as there is usually ample generator and line capacity. Another consideration is that a small motor generally commutates high current peaks better than a large motor.

"Controlability"

Perhaps the leading reason for increasing the number of acceleration contactors on larger motors is to get a characteristic which it is hard to describe and which I will call controlability. It is usually satisfactory if a small motor accelerates from rest to full speed almost before the operator is aware of it, but in the case of large motors, operating heavy and important machines, the operator must have more sensitive and responsive control over the starting and reversing of the motor. Bearing these three thoughts in mind, it seems to me the number of acceleration contactors can be determined somewhat in the following manner: If the motion is merely one of rapid reversal, and line disturbances need not be con-

sidered, select the number of acceleration contactors from the standpoint of the size of one motor; if the question of line disturbances is important or if you are concerned with the controllability of the machine, select the number of acceleration contactors from the standpoint of the total horsepower.

There is time to discuss only very briefly a few of the many changes in the controller itself, which have been suggested for the control of mechanically connected motors in parallel. Fig. 11 represents a scheme for controling two motors with one set of reversers and one acceleration resistor. The two fields are in series with each other and in parallel with a balancing resistor. This connection assures the same current in each of the series fields, but there is no assurance that the correct amount of current will flow through the series fields. In installing a controller of this kind, cast grid resistors are generally used for the balancing resistor, having a cold ohmic resistance equal to the cold ohmic resistance of the two fields in series. During operation the balancing resistor and the fields both become heated, but the change in resistance will probably be unequal, inasmuch as they have different temperature-resistance coefficients and probably different current capacities. Consequently the series fields receive considerably more or less than half of the total motor current, leading respectively to overheating or diminished torque. It is almost impossible to divide the current equally, at all temperatures, between two low resistance paths in parallel.

When it is necessary to insure uninterrupted operation of a machine driven by several motors some engineers have preferred an entirely separate controller for each motor rather than the two-pole or three-pole controller which I have advocated. They have argued that in the event of an overload, both motors were stopped with the double-pole method of control, but with separate controllers, only one motor was stopped. As a modern controller can be reset in one or two seconds after operation of the overload device, I do not feel that this is a serious objection. Another argument has been that if a control circuit or an operating magnet failed on a double-pole controller, then the entire controller was temporarily useless, whereas with the same accident with two entirely separate controllers, the undamaged controller could be maintained in operation. There is some merit to this contention, but an argument against it is that there are just twice as many coils and control circuits on the two separate controllers as there are on the one double-pole controller.

With two separate controllers there is no certainty that the important circuit changes will occur in each motor circuit at precisely the same time. There is danger, therefore, of unbalancing and of circulating currents, although it is true that these will exist for only a brief period of time. They constitute a menace however, which, in my opinion, should weigh heavier as a possible cause of motor trouble than the two arguments which I have mentioned above as favoring the use of an individual controller for each motor.

If two motors are permanently in series, they, of course, require only the amount of current normally demanded by one motor of the same size. Each motor exerts full torque up to half speed, but at any greater speed the performance of two motors permanently in series is entirely different from the performance of two motors permanently in parallel. Two motors permanently in series will have a diminishing torque, whereas two motors permanently in parallel can maintain full torque up to full speed. This has sometimes been considered an advantage for roller table service. The line of thought has been that the important consideration is the reversing and acceleration up to perhaps half speed, and that it was a positive advantage if the motors did not have so much disposition to race if allowed to run in one direction for a considerable period of time. I have known of two or three mill tables where parallel connections were first tried for a while and where later, series connections were substituted. By changing to series connections it was found that the motors did not race so much and that reversal was made easier. It was found, however, that the table was slowed down some, or in other words, did not have as large a capacity to move steel. Of course, with motors permanently in series there is no danger of circulating currents or unbalanced load. The mechanical connection precludes the possibility of one motor reaching high speed while the other motor slows down, which would be a real hazard if the motors were free to run at different speeds. Therefore, from an electrical standpoint, permanent series connections must be regarded as satisfactory.

It is probably pertinent to inject here a brief discussion of the controller for motors permanently in series. So far as its capacity to carry current is concerned, this can be decided from the standpoint of the size of one of the motors. However, the heating of the

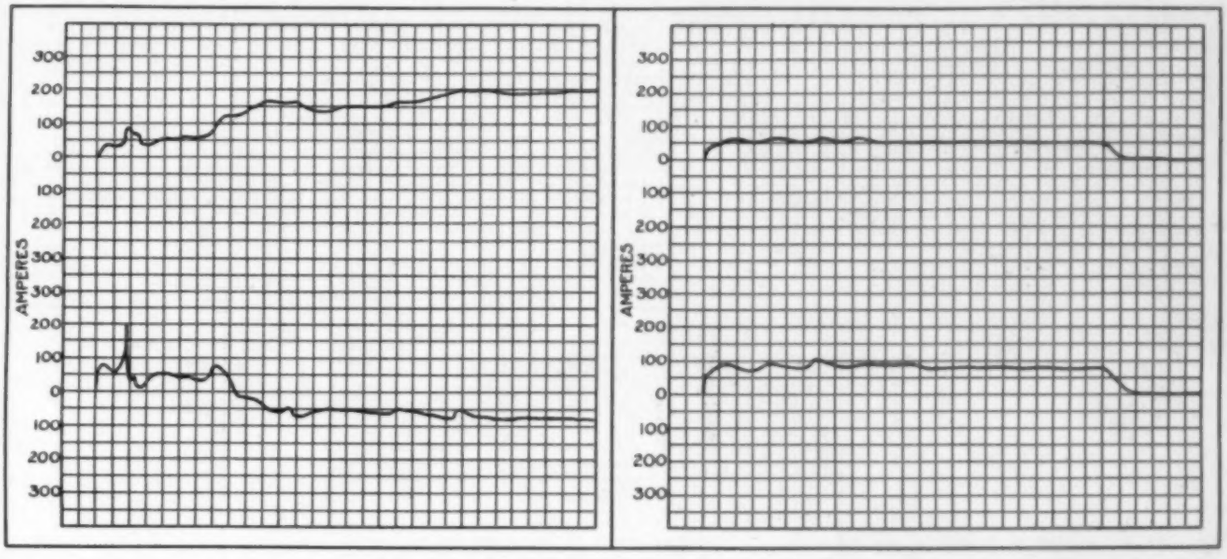


FIG. 12—CURRENT CURVES OF TWO MECHANICALLY CONNECTED SERIES MOTORS. FIG. 13—UNEQUAL CURRENTS IN THE FIELDS OF TWO MECHANICALLY CONNECTED SERIES MOTORS

reversing contactors and the line contactor is due more to the arcing at the contacts than to the passage of current when the contactors are closed. The heat developed by an arc is largely determined by the persistence with which the current endeavors to flow when the circuit is opened. It is the inductive quality of the circuits to be interrupted which largely decided the severity of the arc at the point of interruption. In the case of a series motor, this inductive

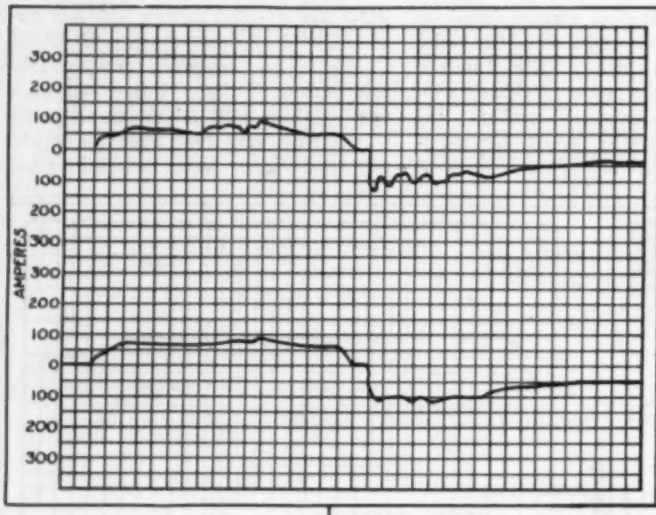


FIG. 14—MOTOR CURRENTS AFTER EQUALIZING FIELD WITH RESISTANCE

effect is represented mostly by the series field, and with two series fields in series, there results a much hotter arc than with only one series field. Therefore, it is erroneous to determine the size of arcing contactors for motors permanently in series, from the horsepower rating of only one motor. Another consideration is the amount of resistors that must be supplied. If two motors in series reach full speed and are then suddenly reversed, there is a voltage at the moment of reversal, equal to the sum of the line voltage, the counter-electromotive force of one motor, and the counter-electromotive force of the other motor. Roughly speaking, this is about three times the line voltage, which demands more resistors for reversal than in the case of one motor.

I have mentioned the belief held by some that it is easier to accelerate two motors than one motor having a rating equivalent to the sum of the two motors. I have made a rather thorough investigation of mill-type motors to determine in a variety of cases, the time required to accelerate the armature from standstill to rated full load speed, supplying the motor with the usual acceleration current. Although in some cases, the moment of inertia of the armature increases more rapidly than the horsepower rating, yet this is more than overcome by the fact that the normal full load speed is less in the case of the larger motors. I cannot find any support of the theory that a small motor can be accelerated to full load speed more rapidly than a large motor, assuming in each case the usual acceleration current and taking account of the fact that the normal speed of large motors is less than that of small motors.

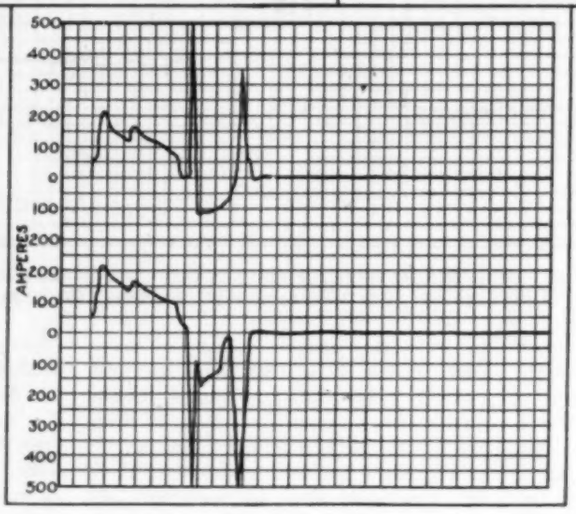


FIG. 15—CIRCULATING CURRENTS AT THE MOMENT OF REVERSE

I am able to present a number of current curves of two mechanically connected motors permanently in parallel; these records were made by a double recording ammeter built specifically for this investigation and capable of indicating graphically the simultaneous variations of current in two entirely separate circuits. So far as I know they are the first curves of this kind which have been made. Each figure shows the current changes in the two different motors and for brevity I shall refer to them as the top and bottom motors, meaning thereby, the motors, the curves of which are shown respectively at the top and bottom of the figures.

Fig. 12 represents two 25-horsepower, 230-volt, series motors operating the bridge motion of a crane having a 116-

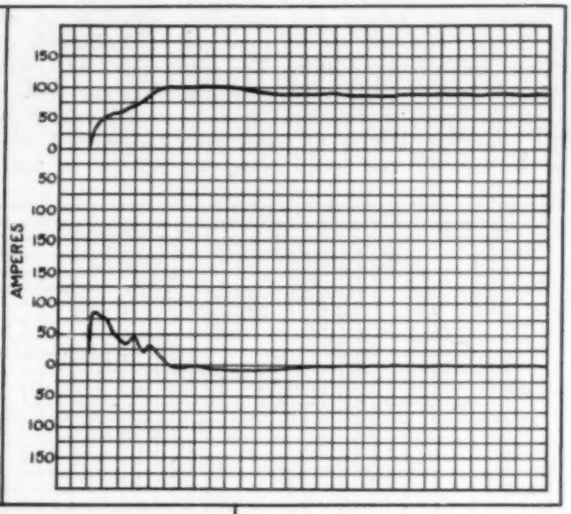


FIG. 16—CURRENT CURVES SHOWING THE EFFECT OF IMPROPER CONTROL DEVICES

foot span. The controller is identical with that shown in Fig. 5; in other words, there is one set of reversers, one acceleration resistor, one set of acceleration contactors. The fields are permanently in parallel, and the armatures are permanently in parallel. To our surprise, we found that the current in the top motor rose to 200 amperes, whereas the current in the bottom motor actually reversed and reached a value of 80 amperes. The bottom motor, therefore was acting as a generator and was retarding the motion of the crane to the extent of 20 horsepower. In other words, one motor alone would drive this crane faster than the two motors in parallel. It was surmised that this condition was due to unequal currents flowing through the series fields and the instrument was connected to measure the currents in the series fields.

The results of this investigation are shown in Fig. 13, from which it can be seen that the series field current in the bottom motor is about 50 per cent larger

than that in the top motor. To correct this unbalancing, additional resistance was placed in series with the field taking the largest current, making the division of current as nearly equal as it was possible to do with the means at hand. Fig. 14 shows the motor currents after the fields had been equalized. One motor takes about 60 amperes running current and the other about 40 amperes, but by comparison with the conditions shown in Fig. 12, the installation could be regarded as fairly satisfactory. The current, at least, flows in the same direction in each motor. Fig. 16 relates to two 20-horsepower, 230-volt, series motors driving another machine. The controller was the same type that was used in the previous test. When acceleration was completed, the top motor took 90 amperes, whereas a small current of about 5 amperes passed through the bottom motor in the reverse direction. This particular machine has been running in this way for two or three years, and if anyone had remonstrated about this type of control, probably the answer would have been that inasmuch as it continued to run, it was all right. Within the last few months, however, the motors have given serious trouble, and it will soon be necessary to replace them. The point which I wish to emphasize, is that these two motors would have had a liberal surplus of capacity had they been controled in a correct manner. They were originally made larger than seemed strictly necessary in order to provide just this capacity for emergency, but due to the poor method of control, one of the motors was made to take so much current that there was no safety margin left. In other words, if one of two motors takes much the larger share of current, no doubt your conservatism in selecting motor sizes, will enable this equipment to operate for sometime, but you have removed that emergency capacity which you intended to have and which would undoubtedly have resulted in longer life and fewer interruptions to service.

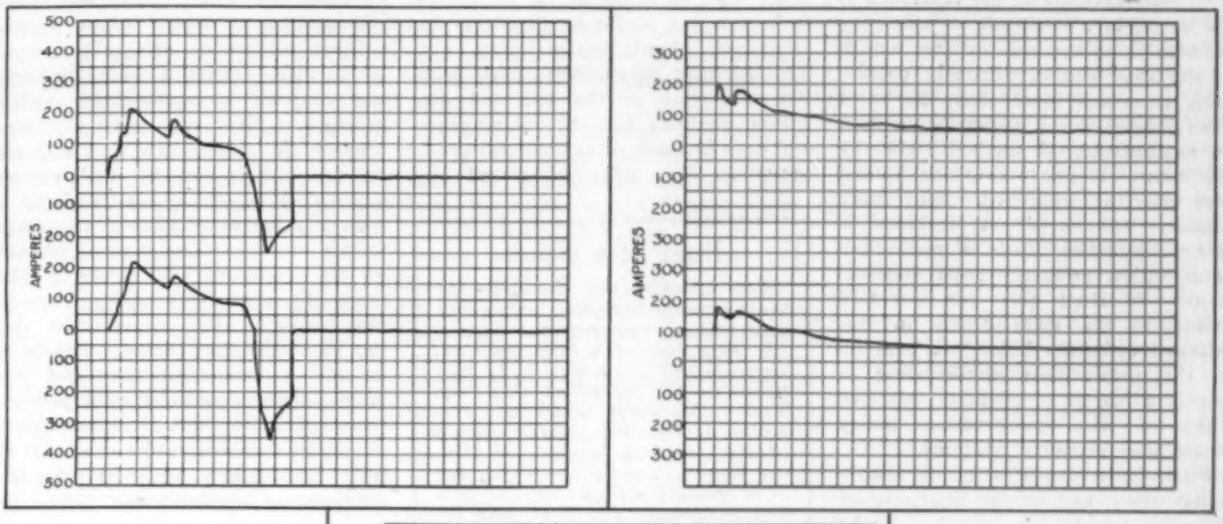


FIG. 17 — ELIMINATION OF CIRCULATING CURRENTS SECURED AT THE EXPENSE OF UNEQUAL LOAD DISTRIBUTION

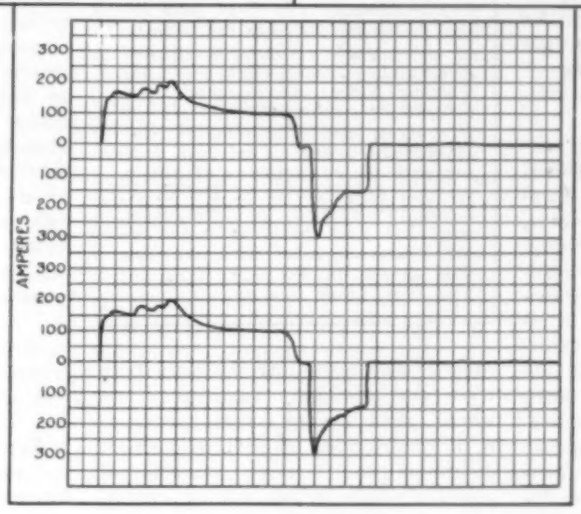


FIG. 18—ACCELERATION AND REVERSAL OF TWO 50-HORSEPOWER SERIES MOTORS

Fig. 15 relates to two 25-horsepower, series motors regulated by a controller of the type shown in Fig. 6; in other words there are individual reversers for each motor, one acceleration resistor, one set of acceleration contactors, and each series field is connected to its armature. I pointed out previously that this type of control is satisfactory for acceleration from standstill, but at the moment of reversal, heavy circulating currents come into existence. Fig. 15 is a striking confirmation of this theory. The acceleration is satisfactory, but at reversal, the bottom motor reverses the polarity of the top motor and a circulating current of at least 500 amperes flows through the two motors in series. There is a peculiar diminishing of this current shown on the curves with a subsequent reestablishment of a somewhat smaller circulating current. I am unable to explain this, but it may be due to surges or it may be that the operator pulled the master switch to the "off" position and then threw it back again. This does not matter, however, the important point being the existence of the heavy circulating currents. An attempt was made to correct this difficulty by connecting an equalizer from the junction of the series field and armature of the top motor to the junction of the series field and armature of the bottom motor. This was merely a reversion to the type of controller shown in Fig. 5, with the fields permanently in parallel and the armatures permanently in parallel. The danger of circulating currents on reversal, was removed, but the division of load was not good, the results being indicated in Fig. 17.

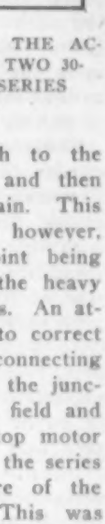


FIG. 19—SHOWING THE ACCELERATION OF TWO 30-HORSEPOWER SERIES MOTORS

Figs. 18 and 19 show the operation of what I consider the correct method of control. The connections are those of Fig. 9, which include for each motor, individual reversers, an acceleration resistor, and a set of acceleration contactors. The controller is made up of two-pole contactors throughout, one pole

(*Continued on page* 1006.)

Conservation and Economic Theory

In a Brilliant Discussion of the Problem of Good Husbandry of Resources Dr. Ely Shows That the Interests of the Mass Must Come Before Those of the Individual Without Destroying Initiative

BY RICHARD T. ELY

CONSERVATION, narrowly and strictly considered, means the preservation of the resources of the earth, in a condition of efficiency as nearly unimpaired as the nature of the case admits. Broadly considered, it means more than the word itself implies, for it naturally includes an examination of methods whereby the natural inheritance of the human race may be improved. Still more broadly considered, it includes a treatment of the effects of productive conservation measures upon distribution. We shall give our attention briefly to the main points in this informal definition before we pass on to the thesis that conservation is largely a matter of property relations —that a wise conservation policy means wise property relations.

First, conservation suggests simply preservation, and, in the treatment of the subject which we have had in the United States, emphasis has been laid upon the past and present waste of natural resources and upon the means of putting a stop to this waste.

Conservation is in large part economics, one of our fundamental thesis. Conservationists seek to control franchises for the use of waterpower, with this end in view, exacting payments for the public treasury in cases where otherwise we would have surplus value. They wish also a complete public control of mineral treasures, brought about by leases for the exploitation of these treasures when in public ownership, so that the lessees may receive no more than fair competitive gains; but some conservationists are inclined to look favorably upon at least a limited public operation of mines as well as ownership. The distribution of wealth and income is then always included as an aim in thorough conservation discussions.

Includes Two Orders of Inquiry

But when we reflect seriously on the subject of conservation, we see that we have to do here with two orders of inquiry. One of them falls within the broad field of the natural sciences; the other is economic in nature and is concerned with property relations. The geologist must instruct us about the formations of mineral treasures, about their amounts so far as actually known and so far as they may be estimated, about exhaustibility, etc. The scientific agriculturist deals with the cultivation of the soil and discusses methods for the maintenance and even increase of agricultural productivity. Men who understand the natural laws governing the growth of trees are absolutely required if we would frame a wise forest policy. It is a question of natural science to determine the relative amounts of forest products which can be expected under low and middle and high forest culture, all involving different periods of time.

But chief emphasis must be laid on the too much neglected question of property relations. Is the system of leasing public land to private parties favorable in the case of mines? We have to do in this case with the relations of public property to private operation and to private property in the implements of operations. Shall the federal government, the states, cities and other local political units acquire private lands for forestry? Here we are concerned with the extension of public property in land and the corresponding contraction of private property in land. How shall we encourage oyster culture? Shall we make the beds of bays and rivers and bodies of water where oyster farming is feasible private property? If so, we extend private property and contract correspondingly public property. Shall we reserve public property in underwater land and encourage oyster farming and similar production of other sea food by a system of leases which will encourage private investments of capital? Again, we are concerned with property relations. It is in the property relations most suitable for conservation that the chief difficulty arises; and it is on this account that the chief role in conservation belongs to the political economists, who must cultivate more diligently than heretofore that part of their field which we may designate as economic jurisprudence. When we decide upon what we want so far as property relations are concerned, engineers and other technical men will be able to carry out the desired policy, and political science, including administration, must be called on for aid. Oyster farming will flourish when we devise and put in force right property relations, and it will furthermore flourish without the establishment of injurious private monopolies.

Irrigation an Example

Irrigation also furnishes an excellent illustration. The government of the United States has encouraged technical investigation. Much effort, and very properly, has been put upon ascertaining the underground flow of water and what is called the duty of water, that is, the work which a given quantity of water may accomplish, the aim being to avoid waste and accomplish the maximum of effect with the minimum of effort. The questions of when and how to apply the water are involved here; and many other technical questions, some of them purely engineering, some of them primarily agricultural, could be mentioned. These are technical and essential. But litigation has been prominent and in some parts of the country has ruined many a farmer, resulted in mutual hatred of neighbors, and occasionally even bloodshed, while an appreciable proportion of

Part of a Book

The accompanying discussion of the unusually important subject of conservation, was prepared by Dr. Ely as a part of a book on Conservation and Economics, to be published by the Macmillan Co., New York. This paper, which was presented at the 1916 *annual meeting of the American Institute of Mining Engineers under copyright, has been specially released to The Iron Trade Review. The book now being edited by Dr. Ely will consist of four parts: Conservation and Minerals; Conservation in the Various Stages of Economic Development; Conservation of Human Resources, and Conservation and Economic Theory. That part dealing with the conservation of minerals will be prepared by Dr. C. K. Leith, University of Wisconsin, who has contributed a paper on the conservation of iron ore that will appear in the next issue of The Iron Trade Review.*

From a paper read at the recent New York meeting of the American Institute of Mining Engineers.

the benefits of improved farming by means of irrigation has been swallowed up in the needless costs, direct and indirect. And the vital question of property relations was neglected in the meantime, one great department, that of agriculture, at one time even taking a discouraging attitude toward economic study. However, this has all been changed under the efforts of the present secretary of agriculture. Now, when property relations are settled, the rest becomes comparatively easy.

The United States government in the reclamation service has not neglected property relations so far as its projects are concerned, for they are based on a rearrangement of property relations in the interest of the public and the parties immediately interested. I refer here to the giving up of old priorities so as to promote a better distribution of water.

Economic Principles of Conservation

Conservation in its economic aspects has such a wide sweep that it is difficult to lay down many principles of universal application, but several can be elaborated which have very far-reaching application. But before we call attention to certain general principles, we ask on the very threshold of our inquiries that you should consider this simple question, "What is waste?" The question is simple; the answer is in many cases extremely difficult. The century dictionary has over two columns devoted to the word waste as noun, adjective and verb, but does not satisfactorily answer our question. Under the verb, I find this: "To expend without adequate return." That is, at any rate, helpful. You see apples decaying on the ground in my orchard. You ask, "why this waste?" If I reply, "It will take two dollars worth of time to gather one dollar's worth of apples," are you satisfied that there is no economic waste? But this is precisely the case with a great deal of what the conservationist frequently calls waste. Now I shall not attempt a definition of economic waste, but I hope that the remainder of this paper will throw some light on the question, and will show that often we must choose between destruction of a proportion, larger or smaller, of natural resources and a loss of human well-being; and as the natural world exists for the human world, we know how we must decide when the issue is clear-cut between the two.

Conservation means in a large number of cases what economists usually designate as intensive as opposed to extensive use. Now intensive use means in general high price. This is true in agriculture—excellent fences, careful cultivation of the corners of field and the edges near the fences, if there are fences; also fields entirely free from weeds, which means the hoe as well as the horse cultivator. It means going beyond the point of increasing returns to decreasing returns in most cases. Nearly if not quite everywhere in the United States the intelligent farmer stops when to go further decreases his net money income; this means in a new country very often that the hoe is never used, that the edges of fields are ragged, that fences are not so neat in appearances as esthetic interest would demand.

Now this can be illustrated endlessly, in mining, as well as in agriculture. If we save all the ore taken from the mines in the Mesabi region in Minnesota, the price of iron ore must increase very materially or wages must fall, or both effects must be produced and either one means lessening real incomes of the community at large. Somewhat more economical methods could doubtless be employed at present prices for ore and present wages; but at best great waste of natural resources must continue, and a great deal of the ore must remain unutilized. Conservation of natural resources everywhere finds its sharp limitations in human resources. Once again, conservation means a sacrifice of the present generation to future generations, whenever it is carried far, this conflict beginning far before the point is reached which conservationists are inclined to advocate. This is implied in what we have already said. High prices and low wages, or even high prices with present or higher wages, mean a sacrifice of the interests of the present consumer. How shall we balance the interests of the present and the future? If we put them on absolutely the same plane, we could with propriety forego all use of the exhaustible natural resources like petroleum and natural gas; it would be at any given moment of time indifferent whether or not we used them, and they might remain forever unused—a *reductio ad absurdum*.

A well-known writer finds "the real heart of the conservation problem" in "the conflict between the present and future". He says that "the primary problem of conservation, expressed in economic language, is the determination of the proper rate of discount on the future with respect to the utilization of our natural resources." He then continues as follows:

"Some discount of the future, there must be. If society reduced the discount on the future to zero, the period of utilization would be increased to infinity; and therefore, the amount of present use would become infinitesimal. Conservation as a single principle of action involves the equal importance of future wants and present wants. It requires that the want of the infinitely distant future shall be as important as the want of the immediate present. Conservation as a single principle of action is reduced to an absurdity."

This is precisely the conclusion we have reached. Any positive, statistical and mathematical solution is an impossibility, because the solution depends in the final analysis upon questions of individual social philosophy. What is the purpose of existence; the source and nature of ethical obligation; our duties to posterity? All are questions of great import and beyond the range of economic science. But taking as a basis the ethical notions and sentiments of normal men, or perhaps those somewhat above the average man, we can find guiding principles and helpful suggestions in economic theory which we must apply as best we can in concrete cases in their infinite complexity.

Classify Natural Resources

Now, as one of the first steps in conservation policies, we must classify natural resources, because they differ markedly with respect to the intensity of the conflict between present and future interests. Some natural resources may be maintained forever or at least indefinitely with use; others may possibly be increased indefinitely while being used; others show increasing scarcity and exhaustibility; and where supply is so sharply limited in proportion to demand that we begin to feel the effects of coming exhaustion and where no renewal is possible, we have the sharpest conflict between present and future. Let us for our present purposes adopt the classification of Professor Gray:

"Natural resources may be classified as follows:

"I. Resources which exist in such abundance that there is no apparent necessity for economy, either in present or future. For instance, water in some localities.

"II. Resources which will probably become scarce in the remote future, although so abundant as to have no market value in the present. For instance, building stone and sand in some localities.

"III. Resources which have a present scarcity:

1. Not exhaustible through normal use: Water powers.
2. Necessarily exhausted through use, and nonrestorable after exhaustion: Mineral deposits.
3. Necessarily exhausted through use, but restorable: Forests, fish.
4. Exhaustible in a given locality, but restorable through the employment of other resources of a different

kind or of similar resources in different locations: Agricultural land."

Interest represents the difference between present and future to the individual. It has been said in the economy of the state, as in publicly owned forests, interest does not enter, that it is a concept in distribution of income among private persons; but, however this may be, we cannot avoid the recognition of differences between present and future. Can it be asked that we should do more than discount the future at the lowest possible rate of interest paid by a prosperous state with well-managed finances, say 2 per cent? I throw this out as a suggestion.

It is essential at this point that we consider the case of copper and other natural resources, which are probably fundamental conditions of permanent national existence. Even if there is some doubt about this, so long as it is at all probable that any national resource is essential to the continued and permanent existence of the nation, this resource occupies a peculiar condition. It is a first principle of political science that the state has perpetual life. States have perished in the past, but political and economic science cannot take into account the possibility that our own national life will ever cease to exist. All wise plans must be based upon the hypothesis of continued national existence. Now, in a case of this kind the future value of the natural resources rises to infinity, and however much we discount the future, we must still practice conservation. We must attempt so to utilize every natural resource of this kind that it may last as long as possible, using it now and using it hereafter for as long a time as possible. I think there in reality the interest rate cuts no figure. When we consider resources of this sort, we find that the definition given by C. R. Van Hise, president of the University of Wisconsin, is applicable: Conservation means "the greatest good to the greatest number—and that for the longest time."

Adequate conservation in general means a course of conduct in economic affairs which is dictated by the common interest, but which will not be followed by the private persons under a system of non-intervention. The complaint of the conservationists is precisely this, that the individual does not, as a matter of fact, conserve natural resources. What is going to induce the private person to follow the desired course of economic conduct?

We consider, among various possibilities, the individual, through ignorance, fails to follow a socially desirable course of economic conduct, when it would be in his own interest. We have already seen that often, perhaps in most cases, the individual could be more careful, more painstaking, more intensive in the sense of conservation—for not all intensive uses mean conservation. We have, as a remedy against ignorance, education; and education can discover many new ways of conserving, to a greater degree than at present, all natural resources.

Even with respect to the present, education, if properly directed, will result in a diminished waste of economic goods. Psychical development fails to keep pace with economic changes. We have in general left behind us the days of crude plenty, but have not changed our psychical make-up nor our habits to correspond with new economic conditions. Here the need is intellectual and moral education—a better vision and more altruism. We need a keener social consciousness and a new state-sense, if we ever hope to solve the problems of conservation.

Must Plan for Future

The individual is too frequently thoughtless and indifferent with respect to the future. Education of the intellect helps to a slight extent, because as men become more intellectual, the future means more to them. Moral education helps still more, as it means precisely a strengthening of the other-regarding feelings as opposed to self-regarding impulses. It means more self-control and ability to sacrifice, within rational limits, the present for the future. Better government means that the future counts for more, as it is more certain. Better health and long life further decrease the premium which the future must pay for present sacrifices. Without adding further consideration, we may generalize as follows: Every step forward in civilization means increased regard for the interests of the future.

But, on the other hand, we must acknowledge that enlightened self-interest has a greater role to play in conservation than is generally understood. When attention 15 years ago was called to the enormous waste of natural resources, the private owners began to think about the possibilities of profitable conservation, and they are still making investigations and improving methods. Great mining companies particularly may be mentioned as illustration, and naturally the owners of the fee in mining properties have shown a special concern. Real progress has thus been made; but the rate of interest sets a limit. Some ore companies have been obliged to recede in part from earlier conservation practices, because they found no prospect of getting interest on the investment involved in carrying saving, so far as they were doing. Large concerns are apt to be operated by far-seeing men, who acquire at times an interest of affection, so to speak, in these concerns, and they will be inclined to go as far as is practicable in conservation; as the country grows older, the interest rate is likely to fall and other causes will favor an increasing degree of conservation, due to private initiative.

But there is a sharp limit to the economic sacrifice that we may reasonably and ethically ask the private person to make for even the present welfare, and the limit is still sharper when we come to consider the interests of future generations. When it is possible and as a general principle, social burdens should be socially diffused and socially borne.

Let us consider some application of the principle we have just formulated. We know now that it is one of the prime functions of the state to raise the ethical level of competition by legislation and administration. Men may work 12 hours a day under the system of *laissez faire* and their employers may compete with each other. If, by the state, the number of hours is reduced to eight, the competition of employers may continue unchanged, save that it takes place on a higher ethical plane. Endless illustrations could be given, taken from Sunday work, child labor, sanitary conditions, etc. Now we may similarly establish a level of competition based on the principles of conservation. Practices which are not in accord with that level of conservation, which we wish to establish, may be prohibited. When we decide how carefully the coal should be mined, and how much waste of natural resources in the exploitation of iron ore we are willing to tolerate as a maximum, we may prescribe methods giving the desired results, and we must bear the pain or burden in higher prices. Competition would not allow one individual to increase his costs greatly above those of his fellows; and so common action is a necessity. The mention of competition suggests that unregulated and uncontrolled, it is, generally speaking, destructive alike of human and natural resources, and that it is a force which like the flow of rivers needs to be bridled and guided to produce socially beneficent results. Destructive competition can be prevented only by social efforts. Again, President Van Hise points out

the evils resulting from those "trust-busting" campaigns of politicians who advocate competition at all times and places and let loose upon us forces of destruction.

But as the principle of regularities in large numbers forms the basis of the vast business of insurance, it also furnishes a considerable scope for the activity of the state in the conservation of human natural resources. It is well known that individuals, especially among the wage-earners, are too willing to take risks to life and limb. Let us suppose the chance of becoming a helpless cripple in the course of a year is as 1 to 10,000; this seems so small that the individual is generally ready to overlook it, and neglects measures to remove the danger. But to society there is no chance, only certainty of this human loss, which in its ramifications is far greater than is at first apparent. It means 100 wrecked existences per million and 10,000 per annum in a population of one hundred millions. We have in this principle of regularities in large numbers a wide scope for society to promote conservation alike in its own interest and in the interest of the individual. The safety first movement is one of many evidences of an awakening realization of possibilities in this direction.

But we may look at this question from still another angle. Protectionism has often an educational value. When we prohibit certain practices which exhaust natural resources rapidly, it will often be found that through the pressure of legal force we shall be stirred out of a certain inertia of lethargy, and discover better methods which involve little or no increase in expense. But we find ourselves in a position when we shall frequently have to decide between private property and public property. The benefits of private property come in large part from the free initiative it allows the private property owner, and this is based on the hypothesis that in following his own initiative and knowing his own interest he is following a line of conduct which is in the interest of society. This is illustrated by the condition of the farmer, where we have a fairly satisfactory system of land tenure. The intelligent farmer in pursuing his own interest, in raising the best crops and animals at a minimum cost, is doing exactly what it is in the interest of society he should do. The case of our railways is the opposite, for we regulate these to such an extent as to remove from private property a large part of its satisfactions and its benefits. So if we are obliged to regulate very far private property in the interest of conservation, we have a strong ground for public property; as illustrated in the case of forests, and in this case public ownership is the world over gradually gaining on private ownership. Consideration of conservation then leads us to the following:

The principle of guidance in changes from private to public property and from public to private property.—Private property yields the best results when the social benefits of private property accrue:

(*a*) Largely spontaneously.

(*b*) When occasionally they are easily secured by slight applications of force.

(*c*) When the social benefits of private property are secured as the results of single public acts occurring at considerable intervals.

(*d*) Private property may yield excellent results, when in more or less frequent cases a continuous and considerable application of force may be needed to bring its management up to a socially established ethical level.

But in proportion as the social benefits desired are secured by increasingly intensive and increasingly frequent applications of public power, the advantages of private property become smaller as contrasted with the advantages of public property. We have furthermore a ground for passing over to public property when for the sake of the public welfare now or in the future a kind of use is exacted, involving a greater sacrifice of individual and corporate private interests than is warranted by the doctrine of the police power, as accepted at a particular place and time.

No one is warranted in jumping to the conclusion that this principle means a suppression of private ownership of land and capital and of private initiative. On the one hand, our classification of natural resources shows that, so far as we can now see, they are mostly adapted to private ownership; we have also observed improved practices of private owners, rendering less urgent and less far-reaching the demands of public ownership; on the other hand, the growth of the police power in itself makes the field of public ownership narrower than it would be otherwise. Yet the general principle holds and no one can now foresee where the line will be drawn in the future. In the case of forests, the civilized world now recognizes a large amount of public ownership as necessary; so also with regard to the shores of harbors; so also with regard to mineral treasures, where there is general opposition to further alienation of the fee where it is now in public ownership.

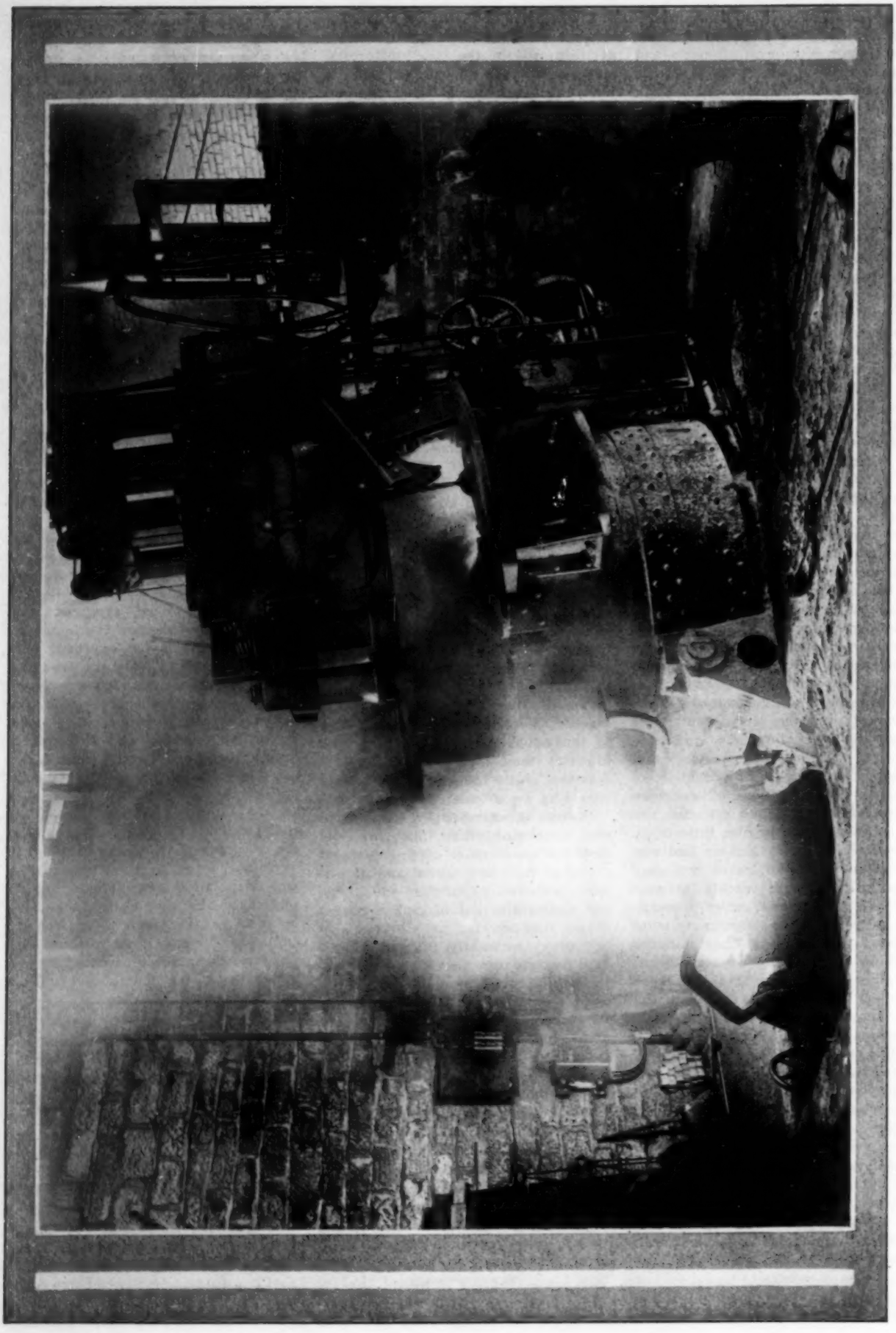
Conservation then necessarily means more public ownership more public business; this means a demand for better government; and this means giving men a real career in the public service.

It is only through a conservation commission or various conservation commissions—for several may be required—that we can put in force conservation. Legislation can never solve these complex problems, but can simply lay down the general principles, expressive of the will of the legislature; and in concrete cases the commission must make the application of principles, in other words, ascertain the will of the legislature. The commission must ascertain what is excessive present use and what is waste, must in concrete cases weigh over against each other present and future, must decide upon the burden to be imposed on private property under the police power, and upon compensation which is feasible and required; it must set limits to the sacrifices which may be legally and ethically exacted of the individual and the private corporation. From time to time it will have to recommend the establishment of new principles by legislation; and the courts, as having the last word in social progress, will review certain decisions.

But the great burden must rest with commissions. And do not commissions give us the democratic solution of the complex economic problems of our day? The legislature lays down the principles, and if the commissions furnish men with careers, with honor, the public may command as well-trained capacity and as high talent as the greatest private corporations and for far less cost. Recognition, the development of democratic sources of honor, open careers to capacity and talent all these will draw to the service of the people men who will be equal to the tasks of government, and who in their own persons will illustrate the nobility of social service and make men proud to say: "I am a civil servant."

Condensed Catalog

The sixth annual volume of the American Society of Mechanical Engineers' Condensed Catalogs of Mechanical Equipment has just been issued in an enlarged and improved form. The title quite accurately describes the subject matter of the book, for it is simply a condensation of catalogs of mechanical equipment, supplemented by a classified directory. The catalog is divided into five parts, part one containing power plant equipment; part two, power transmission machinery, elevating and conveying



TAPPING A 2,500-POUND MAGNESITE LINED HEROULT ELECTRIC FURNACE AT THE CRUCIBLE STEEL CASTING CO.'S FOUNDRY

machinery, and hoisting and transporting machinery; part three lists raw materials, metals and alloys; part four, metal working machinery, machine tools and accessories and shop equipment; while part five contains measuring and recording apparatus. Excellent illustrations accompany the descriptive matter.

Following the catalog proper is a 38-page section containing valuable mechanical engineering data in the form of tables, charts, formulas, etc., and the last 113 pages are devoted to a mechanical equipment directory. Up to 1915 the society held strictly to the policy of indexing in the directory only those firms using and paying for space, but in the 1915 edition the policy was altered and, to make the book more valuable as a reference work, manufacturers were offered the opportunity of securing listings at a small cost, and independently of the use of space. The experiment proved highly successful and this year the book has been made still more valuable by listing in the directory the names and addresses of all the manufacturers in the field that were accessible through the records of the society and through the connections of its membership.

Electric Furnace Employed in Foundry

THE operation of an electric furnace in a steel foundry, in which a considerable proportion of the output is alloy steel, has been undertaken by the Crucible Steel Casting Co., 801 Champlain avenue, Cleveland. The furnace is of the 2,500-pound magnesite-lined, basic type, sold by the United States Steel Corporation, New York. It uses three-phase alternating current at 95 volts, which is supplied from the power company's plant through a special underground cable. The three electrodes are of hollow carbon, 8 inches in diameter and 76 inches long. The core of each carbon is threaded to receive a screw-shaped rod which makes it possible to fasten two carbons end to end, thereby insuring a continuous electrode as the carbon is worn away. About eight pounds of carbon is dissipated for each ton of steel melted. The electrode guides and holders are water-cooled, and the overflow from the cooling pipes is visible to the melter, thus enabling him to detect any failure of the cooling system.

The melt varies from 2,400 to 2,800 pounds per heat. At the rate of eight heats per day, the furnace has a capacity of about 10 tons per 24-hour day. The power consumption averages about 800 kilowatt-hours per ton of metal poured, and costs less than $10 per ton.

The furnace is tilted by a 5-horsepower motor, and the electrodes are raised and lowered by 2-horsepower motors controlled automatically and by manual operation at the switchboard. The electrical installation provides for automatic cut-off to prevent the furnace from being tilted too far and to prevent the electrodes from moving beyond the proper limits. The electrical equipment was furnished and installed by the General Electric Co., Schenectady, N. Y.

The foundry is devoted to the making of small castings for automobiles, machine tools, etc. Over 25 per cent of the product consists of alloy castings, principally of chrome and nickel steel. Since the installation of the electric furnace the charge has been made up of gates, sprues, and waste from the crucible method of casting, together with punchings, shearings and plate scrap. No difficulty has been experienced in securing sound castings from this metal.

Why the Duplex Process is a Success

BY T. W. ROBINSON

THE paper presented by Dr. Waterhouse is a valuable contribution to the literature of American steel practice. While primarily a description of the duplex plant and process as used at the Lackawanna works, it covers the fundamentals of a development in this country already important, and one that is destined to command greater consideration as time goes on. The term duplex process is an elastic one. In the United States, it may be considered as specifically applied to the primary refining of pig iron in an acid bessemer converter, with a secondary and final refining of the blown metal in a basic open-hearth furnace, either of the fixed or tilting type.

In 1876 this country produced a little over 500,000 tons of steel. Nearly 90 per cent was bessemer, and only 19,000 tons were open hearth. In 1906, 30 years later, our steel production had risen 48 fold, to nearly 23,000,000 tons. Eleven million tons were open hearth and 12,250,000 tons were bessemer.

The year 1906 marks the peak of bessemer steel production in the United States, and will undoubtedly go down in our annals as the zenith of an invention that has perhaps done more for the rapid development of the American continent than any other industrial device. Since then, the decline of bessemer steel in this country has been slow, but certain, and the production of open-hearth steel has increased by leaps and bounds. Of the 32,000,000 tons of steel produced by our mills last year, 8,250,000 tons were bessemer and 23,500,000 tons were open hearth. Why such a change? Primarily this marvelous transformation in method is the American steel master's answer to the demand for steel of higher quality. In response to this demand, the comparatively complex and expensive open-hearth process slowly grew through metallurgical stress and financial strain. Spurred by decreasing bessemer ore reserves, and assisted by mechanical invention and metallurgical discovery, its development in recent years has been rapid. But the tide of industry, like the ebb and flow of the sea, necessitate equilibrium. Change spells disturbance, and there had to be re-adjustment when the open-hearth process rose and the bessemer fell. The outcome is the duplex process with its balancing influence and scrap consumption—a process which last year produced over 1,750,000 tons of steel in this country. It may be that the installation cost of the duplex process is slightly less per ton of product than the straight open-hearth melting process. It may also be that the operating cost of the duplex process is somewhat less, at least in some districts. But the underlying cause of the growth of the duplex process is its independence of a steel scrap supply.

Scrap or its equivalent is an economic necessity for the straight, open-hearth process. It is perhaps reasonable to assume that of our ingot production 20 to 25 per cent is discarded

A discussion of the paper on the duplex process of making steel presented by G. B. Waterhouse at the St. Louis meeting of the American Iron and Steel Institute. The author, T. W. Robinson, is first vice president, Illinois Steel Co., Chicago.

as scrap in the process of manufacture. Probably 7,000,000 tons of our steel production last year went to the melting furnace. To this must be added the reclaimed material from the nation's scrap pile. While the combined amount is large, our scrap supply is today relatively smaller than when the bessemer converter was dominant with its small scrap consumption. Blown metal may be considered essentially as molten scrap, and the duplex process is an important factor in maintaining the equilibrium of the scrap supply of the country.

At the South Chicago plant of the Illinois Steel Co., several years' experience with bessemer blown metal in stationary open-hearth furnaces helped to demonstrate the advantages of the duplex process. At the Gary works there will soon be completed a plant consisting of two 25-ton acid bessemer converters and two tilting open-hearth furnaces, each with a hearth area along the metal line of 46 x 14 feet. This plant may be rated as having a capacity of about 600,000 tons of steel per year. At the South Chicago works, a similar duplex plant is under construction, with the exception that three tilting furnaces are provided instead of two. Two of these furnaces with a nominal capacity of 600,000 tons per year will be used for duplex open-hearth steel. The third furnace will serve as an adjunct to two auxiliary 20-ton electric furnaces. The installations of the duplex process in the United States have thus far been chiefly confined to plants already established. In one process, the blown metal from an acid bessemer converter is introduced into an open-hearth furnace, in which there has been left a residual bath of finished steel. This is the method used at Lackawanna. Another process is that of adding blown metal to an open-hearth furnace where only the preliminary oxides with or without scrap additions have been prepared, and where the heat when finished is completely tapped. The methods are interchangeable, and the adoption of one or the other is subject to local conditions. When a residual bath is used, it is not customary to use scrap on account of slowing down the process. When complete individual heats are made as described, scrap is sometimes used.

Dr. Waterhouse spoke of the use of a "kicker" of partly blown metal. The practice of mixing partly blown metal with full blown metal in the open-hearth furnace is an important element in the satisfactory working of the process on account of the deoxidizing effects of the carbon and the mechanical agitation that ensues. Where only full blown metal is used, similar results may be obtained by recarburizing the blown metal with molten pig iron between the bessemer and the open hearth; or, as was usually the case with the stationary furnaces at South Chicago, by mixing full blown metal and molten pig iron in the open-hearth furnace.

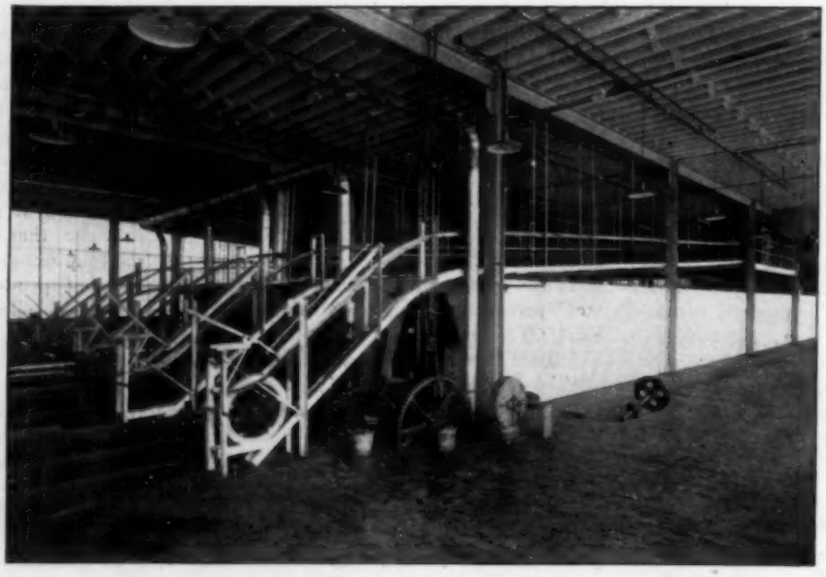
It is proper to record that, as with our other standard methods of manufacture, we are indebted to Europe for the original development of the duplex process. In Europe, however, the duplex process has been often a combination of the basic bessemer and the open hearth, instead of, as with us, a combination of the acid bessemer and the open hearth.

More or less prejudice has existed in respect to the quality of some of the duplex open-hearth steel made in Europe. In this connection, however, it is interesting to recall that at one time there was a good deal of prejudice concerning the quality of straight basic open-hearth steel. But prejudice then, as often now, proved to be but an opinion formed without such a fair consideration of the truth as was necessary for a just determination.

I cannot vouch for the facts in respect to European duplex steel, but if there has been discrimination, it may perhaps be accounted for by the use of the relatively highly oxidized blown metal from the bessemer converter. The truth probably is that any such adverse opinion as may exist is due rather to individual poor practice than to any inherent defect in the duplex process. Certainly the high quality of American duplex steel tends to substantiate such a conclusion.

How Coverings Prevent Loss of Heat

THE Armstrong Cork & Insulation Co., Pittsburgh, has recently conducted a series of exhaustive investigations to determine the amount of heat transmitted through various kinds of coverings for high pressure and superheated steam lines, boilers, breechings, feed water heaters, tanks and heated surfaces. The results of a typical test are shown in the accompanying table. The importance of proper heat insulation has been definitely established in recent years. Engineers, superintendents and managers now have a clearer realization of the loss of heat from unprotected hot surfaces. As an example, a 4-inch bare pipe line, 300 feet long, carrying steam at 125 pounds pressure, with the air at 90 degrees Fahr., will lose the heat equivalent of 105 tons of coal per year. Figuring the fuel cost as low as $1.75 per ton, the annual monetary loss would be $174.13. Important savings have been effected by the use of efficient coverings and in the example given it is claimed that the loss can be reduced $28. The material for covering high pressure steam lines should be a good nonconductor of heat; able to withstand relatively high temperatures without calcining; unaffected by moisture; easy to apply. Primarily this covering must be an efficient non-



ENAMELING OVENS INSULATED WITH HIGH PRESSURE BLOCKS

conductor of heat. The result of a number of experiments led the Armstrong company to adopt diatomaceous earth and asbestos fibre as the components of its covering. The former substance is practically pure silica in cellular form, consisting of myriads of shells or skeletons of marine plants known as diatoms. These shells are exceedingly minute, effectually preventing circulation of air.

The tests conducted on high pressure coverings were run at the Beaver Falls, Pa., plant of the Armstrong company. In testing, a refrigerating machine was started and hot water allowed to flow through an 8-inch pipe. After constant conditions were obtained, the hot water was circulated through the pipe continually, the room being held at any temperature desired. The temperature of the testing room, as well as that of the incoming hot water was maintained constant. Two thermometers showed the temperatures of the water as it entered and left the room. The difference in temperature between the two thermometers was the heat lost by the water in passing through the 10 feet of pipe between the recording instruments. After each test, the average difference in temperature between the inlet and outlet thermometers in the pipe, and between the hot water and the air in the testing room was determined. The number of pounds of hot water flowing in during 24 hours was ascertained and the surface area in the case of bare pipe, or the area at the mean circumference of the covered pipe, was determined. The total loss of heat was computed by the following formula: The heat loss in British thermal units per square foot per degree difference in temperature for 24 hours equals

$$\frac{A\ B\ C}{D\ E}$$

A is the number of degrees loss in temperature of the hot water in passing from one thermometer to the other in the pipe; *B* is the number of pounds of hot water flowing through the pipe in 24 hours; *C* is the specific heat of the hot water, or, in other words, the quantity of heat required to raise 1 pound of water 1 degree Fahr., which is 1 British thermal unit; *D* is the number of degrees average difference in temperature between the air outside and the water inside, and *E* is the area in square feet at the mean circumference of the 10 feet of covering between the two thermometers, or the surface area of the 10 feet of bare pipe, depending upon which is under test.

Since the ordinary steam temperatures, the heat transmission through any insulating material of uniform structure is in inverse proportion to its thickness, the results may readily be reduced to a standard basis, namely, per square foot, at the mean circumference, per 1-inch thickness, per degree difference in temperature for 24 hours. This is accomplished by multiplying the transmission through the covering per square foot at the mean circumference, by the thickness of the covering in inches.

The Armstrong company's high pressure blocks for insulating purposes are adapted to enameling ovens,

Comparative Tests of Covered and Uncovered Pipe

TEST OF 8-INCH HIGH PRESSURE COVERING

Time	Temperature of Water Therm. No. 2 Deg. F.	Therm. No. 1 Deg. F.	Temperature of Room Therm. No. 1 Deg. F.	Therm. No. 2 Deg. F.
8:00	203.3	206.1	24.7	26.9
8:15	203.3	206.1	24.6	26.8
8:30	203.3	206.1	24.6	26.6
8:45	203.3	206.1	24.5	26.5
9:00	203.3	206.1	24.4	26.5
9:15	203.3	206.1	24.3	26.4
9:30	203.2	206.0	24.2	26.4
9:45	203.2	206.0	24.3	26.4
10:00	203.2	206.0	24.2	26.4
10:15	203.2	206.0	24.1	26.4
10:30	203.2	206.1	24.1	26.3
10:45	203.2	206.1	24.0	26.3
11:00	203.2	206.1	23.9	26.3
11:15	203.2	206.1	24.0	26.3
11:30	203.2	206.0	23.9	26.2
11:45	203.2	206.1	23.9	26.2
12:00	203.2	206.1	23.8	26.2
12:15	203.2	206.1	23.7	26.2
12:30	203.2	206.1	23.7	26.2
12:45	203.2	206.1	23.7	26.2
1:00	203.3	206.1	23.7	26.1
1:15	203.3	206.1	23.7	26.1
1:30	203.3	206.2	23.8	26.1
1:45	203.3	206.2	23.7	26.1
2:00	203.3	206.2	23.7	26.1
2:15	203.3	206.2	23.6	26.1
2:30	203.3	206.2	23.6	26.1
2:45	203.3	206.2	23.6	26.0
3:00	203.3	206.2	23.6	26.0
3:15	203.3	206.1	23.7	26.1
3:30	203.3	206.2	23.7	26.1
3:45	203.3	206.2	23.7	26.1
4:00	203.3	206.2	23.7	26.1
Average	203.25	206.11	23.95	26.26
Mean Average	204.68		25.10	

Weight of water from 8:00 a. m. to 4:00 p. m., pounds	3154
Weight of water flowing at above rate for 24 hrs., lbs.	9462
Average difference between thermometers in water, degrees Fahr.	2.86
Average difference between temperature of water and room, degrees Fahr.	179.58
Area of pipe covering at mean circumference, square feet	25.85
Specific heat of water	1.0
Thickness of pipe covering, inch	1.25

$$\frac{9462 \times 2.86 \times 1.25}{25.85 \times 179.58} = 7.28$$

B. T. U. per square foot at mean circumference of covering per 1-inch thickness per degree difference in temperature for 24 hours.

TEST OF 3½-INCH BARE PIPE

Time	Temperature of Water Therm. No. 2 Deg. F.	Therm. No. 1 Deg. F.	Temperature of Room Therm. No. 1 Deg. F.	Therm. No. 2 Deg. F.
8:05	191.0	201.9	41.0	43.0
8:20	191.1	201.8	41.0	43.0
8:35	191.1	201.8	41.0	43.0
8:50	193.8	203.3	41.0	43.0
9:05	194.5	203.4	41.0	43.0
9:20	196.5	204.6	41.0	43.0
9:35	196.9	204.7	41.5	43.5
9:50	196.7	204.7	41.8	43.7
10:05	196.5	204.4	42.0	43.8
10:20	196.5	204.4	42.2	44.0
10:35	196.4	204.4	42.2	44.2
10:50	196.5	204.4	42.2	44.4
11:05	196.4	204.4	42.3	45.0
11:20	196.9	204.4	42.5	45.0
11:35	196.3	204.3	42.7	45.0
11:50	196.3	204.3	42.8	45.0
12:05	196.4	204.5	42.8	45.0
12:20	196.4	204.4	42.8	45.1
12:35	196.3	204.5	43.0	45.2
12:50	196.3	204.5	43.1	45.4
1:05	196.4	204.5	43.2	45.5
1:20	196.4	204.5	43.2	45.7
1:35	196.6	204.7	43.1	45.9
1:50	196.5	204.5	43.0	45.9
2:05	196.3	204.4	42.9	45.7
2:20	196.0	204.1	42.8	45.5
2:35	195.9	204.0	42.7	45.2
2:50	196.3	204.5	42.2	45.0
3:05	196.5	204.6	42.0	45.0
3:20	196.4	204.5	41.9	44.8
3:35	196.4	204.5	41.7	44.5
3:50	196.4	204.6	41.4	44.2
4:05	196.2	204.5	41.0	44.2
Average	195.79	204.15	42.15	44.53
Mean Average	199.97		43.34	

Weight of water from 8:05 a. m. to 4:05 p. m., pounds	3,412
Weight of water flowing at above rate for 24 hours, lbs.	10,236
Average difference between thermometers in water, degrees Fahr.	8.36
Average difference between temperature of water and room, degrees Fahr.	156.63
Surface area of pipe, square feet	10.47
Specific heat of water	1.0

$$\frac{10,236 \times 8.36}{10.47 \times 156.63} = 52.17$$

B. T. U. per square foot of pipe surface per degree difference in temperature for 24 hours.

as shown in the accompanying illustration. These ovens, which are for automobile chassis enameling, are 163 feet long, 16 feet wide and 7 feet high and are installed at the plant of the Willys-Overland Co., Toledo, O. It is said that the insulating efficiency of such blocks in these ovens, is high. These blocks have been adapted not only to enameling and japanning ovens, but more particularly for internally-fired and locomotive-type boilers and for drums of water-tube boilers.

Problems in Motor Control

(*Continued from page 997.*)

of each contactor being in one motor circuit and the other pole being in the other motor circuit. Fig. 19 shows the acceleration of two 30-horsepower, series motors. Fig. 18 shows the acceleration and reversal of two 50-horsepower, series motors. There is little comment to be made on these curves except to say that they are all right. The currents during acceleration, reversal and during normal running are almost the same in each circuit; each motor is doing its fair share of the work, the only uneven division of load being due to imperfections in the motors themselves.

Rotary Pumps for By-Product Plants

ACCOMPANYING the remarkable growth of the by-product coke industry in this country has been an increased demand for pumping machinery to handle the liquids used in the recovery of the hydro carbons. Fig. 1 shows a rotary pump made by the P. H. & F. M. Roots Co., Connersville, Ind., which is adapted to use in circulating wash oil, or straw oil as it is sometimes called, through the scrubbing apparatus.

This oil is pumped to the top of the scrubbers, and as it passes down through the interior, it absorbs the benzol, toluol, zyols, phenol and other hydro carbons from the gas. The oil, laden with these products, flows into a large tank or sump from which it goes to the stills where the oil is relieved of its absorbed burden. The oil is then returned to the pumps to be circulated through the scrubbing system again. The amount of oil handled in a plant of this kind varies from 4,000 to 40,000 gallons per hour and the discharge head is about 125 feet, although in a few cases it runs as high as 150 or as low as 50 feet. In some installations the oil flows by gravity to the pump, but as a rule the suction lift is from 5 to 8 feet. The oil is handled at a temperature of about 120 degrees Cent.

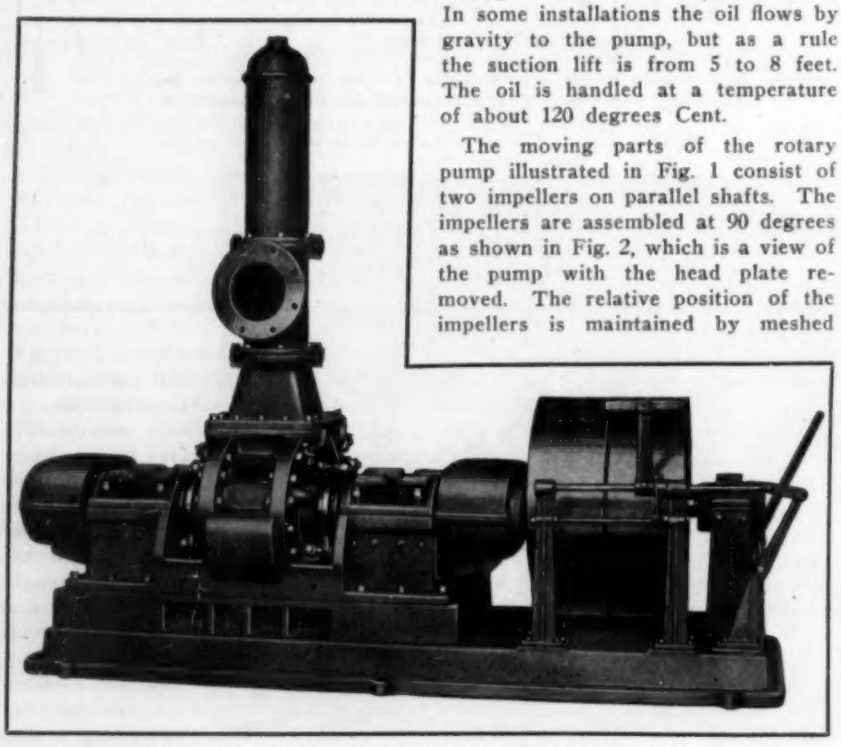


FIG. 1—ROTARY PUMP FOR CIRCULATING WASH OIL

The moving parts of the rotary pump illustrated in Fig. 1 consist of two impellers on parallel shafts. The impellers are assembled at 90 degrees as shown in Fig. 2, which is a view of the pump with the head plate removed. The relative position of the impellers is maintained by meshed gears keyed on the ends of the shafts. The impellers rotate in opposite directions, causing the oil from the suction pipe to become enclosed in the space between the vertical impeller and the case, as indicated at the right of Fig. 2. For an instant there is a body of the liquid which is not open to the suction or discharge opening of the pump, and as the impellers rotate, the discharge side gradually opens, and the enclosed liquid is forced out. Since owing to the shape of the impellers there is at no time a possibility of the oil returning to the suction side, it is evident that a quantity of oil equal to the enclosed volume is discharged at every half revolution of each impeller. Therefore, for each revolution of the pump, four times this volume is discharged.

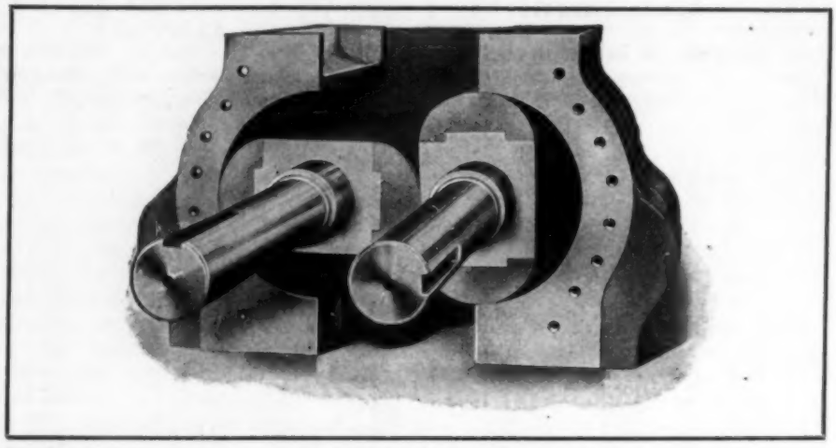


FIG. 2—ARRANGEMENT OF IMPELLERS

The impellers are of steel forged integral with the shaft. This arrangement eliminates the necessity of a pressed and key fit between impeller and shaft and tends to reduce vibration. The removable cast tips on each impeller may be removed without dismantling the machine.

The case is composed of two identical semi-circular castings and two headplates, which are ribbed to insure stiffness. These castings are of close grained gray iron. The bearings are approximately three times

the diameter of the shafts, giving a low bearing pressure. Oiling is maintained by oil chains or rings. A single wedge beneath the lower half box permits vertical adjustment at any time, even while the pump is in operation, if necessary. In the pumps of large capacity quarter box bearings are used. The main bearings are cast intergral with the headplates, giving a compact design and rigidity.

These pumps are used in irrigation service, for reservoirs, condensers, cooling towers and circulating systems in addition to the by-product service already mentioned. When the liquid to be handled is water or a non-corrosive liquid, cast iron and steel is used in the construction of the working parts of the pump. If a corrosive liquid is to be handled, a suitable resisting metal is employed. The pumps range in size from a capacity of 1/10 gallon displacement per revolution up to 50,000 gallons per minute. The range in pressures for low, medium and high lift pumps are 0 to 30 feet, 30 to 80 feet, and 80 to 200 feet respectively. It is said that the efficiencies of these pumps vary from 75 to 85 per cent of the power applied to the pump shaft.

Obituaries

Charles H. Daker, 38 years old, who had been actively connected with the iron and steel trade in the central west for about 15 years, died Nov. 8, in the Suburban hospital, Bellevue, Pa., from pneumonia. He had been ill only a week. He was the son of the late John Daker, of Detroit, where, with his brother, John Daker, he became identified with the steel trade as Detroit representative of the Carpenter Steel Co. He went to Pittsburgh a number of years ago and had been connected with the pig iron trade for the last two years. At the time of his death, Mr. Daker was associated with Eaton, Rhodes & Co., Cincinnati, with offices in the Oliver building, Pittsburgh. He is survived by his widow and two children.

Howard H. Geiger, superintendent of the Oley street mills of the Reading Iron Co., Reading, Pa., died recently, aged 58 years.

William Cooper Cuntz, general manager and director of the Goldschmidt Thermit Co., New York, whose death on Nov. 2, at Auburndale, Mass., was mentioned briefly in *The Iron Trade Review* of Nov. 9, was born in Hoboken, N. J., in 1871. He graduated from Stevens Institute of Technology in 1892, with the degree of mechanical engineer. He then became connected with the Pennsylvania Steel Co., at Steelton, Pa., first with the bridge and construction department, which he represented as resident engineer in Boston, and as European resident engineer in London, Eng. In these capacities he rendered many important services to his company, notably in connection with the erection of the North and South stations in Boston, and in securing of the contract for the construction of the North German Lloyd piers, in Hoboken, N. J. He then entered the sales department, serving as assistant general manager of sales in Philadelphia, and later as district sales manager at Steelton.

At the outbreak of the Spanish-American war in 1898, Mr. Cuntz volunteered for service in the artillery. In 1910, he was appointed by President Taft a delegate to the international railway congress at Berne, Switzerland, the present secretary of the interior, Franklin K. Lane, being the chairman of the American delegation. In the same year, he severed his connection with the Pennsylvania Steel Co. to become a director and the general manager of the Goldschmidt Thermit Co., in New York. Under his management, the business of the company increased very greatly and equal progress has been made in the technical development of the thermit process. His wide experience in the steel industry naturally caused him to take a particular interest in the manufacture of carbon-free metals, and it is largely due to his perseverence and initiative that these metals and alloys are coming into such general use.

CHARLES H. DAKER

Mr. Cuntz is survived by his widow and by his two sons, William Cooper Jr. and Emil Edwards. His residence was at Kew Gardens, Long Island, New York.

Henry H. French, treasurer of the Richard French Iron Works, Worcester, Mass., died at a hospital in Providence, R. I., Nov. 8, from pneumonia, aged 45 years.

Thomas Barnett Miller, for many years a member of the ship building firm of Alexander Miller & Bros., Jersey City, died Nov. 8 at his home in Brooklyn, aged 52 years.

Frederick W. Gerdes, president of the Hall Steam Pump Co., Pittsburgh, died unexpectedly at his home in that city, Nov. 9. Mr. Gerdes was born in Germany, Nov. 24, 1841.

William J. Burlee, who organized the Staten Island Ship Building Co., Staten Island, N. Y., in 1898 and has served continuously as its president, died Nov. 7 at his home in Port Richmond, S. I., aged 54 years.

Checkmating German Enterprise

Birmingham, Eng., Nov. 3. — Important steps have been suggested by Sheffield manufacturers, to the British government, with a view to recapturing the position once held by Great Britain in the high-speed steel tool trade. Within the past dozen years, Germany has made great progress in the development of her tool steel export business, and it is believed that this is largely due to the keenness of the Teuton in establishing the tungsten refining industry. Three-quarters of the world's tungsten supply is produced within the British empire, but before the war all this was refined in Germany, and upon this British users were wholly dependent. The refining industry has now been re-established in Great Britain, and the business has already reached large dimensions. The Sheffield manufacturers have asked the government to nationalize the empire's tungsten resources, and reserve them for British purposes. It is believed that this would effectually counteract all German competition.

Wm. Wilkoff, president of the Wilkoff Co., Youngstown, O., and B. C. Vaughn, who has been identified with the general iron and steel trade in New York, have organized the Wilkoff & Vaughn Co. to deal in iron and steel scrap in the east. Offices have been established at 30 Church street, New York City, and will be opened later in other leading eastern cities. It is the intention of the company also to operate several yards at eastern points.

Business News of Nation's Capital

Appointment of Tariff Commission Awaited with Keen Interest—Secretary Daniels Will try to Hasten the Completion of the Naval Building Program

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Washington, Nov. 14, 1916.

APPOINTment of the tariff commission by President Wilson is being awaited with exceptional interest. The President stated recently that he would name the commission soon, but it has been said that he has not yet found an available personnel that is entirely satisfactory to him and may have to defer the appointment owing to this fact. While Prof. T. W. Taussig has been repeatedly mentioned as the probable chairman of the commission, there is a report that Prof. Taussig has concluded to retain the chair of economics at the Harvard University. The President, it is understood, has been anxious to appoint Taussig chairman of the tariff board, despite the criticism the professor has made of the Adamson eight-hour law. Other men of ability who have been named as probable appointees, it has been indicated, might not be found to be available. Such a situation would necessarily compel the President to turn to man of mediocre qualifications, and it is insisted that he is strongly opposed to naming them.

One obstacle is that the salary named by congress for members of the commission was limited to $7,500 per year. Doubtless many men would refuse to serve on the commission because of this limited salary, not because of the financial phase of the situation, but by reason of the fact that it would cheapen the standing of the commission, deprive it of a certain amount of dignity, and therefore weaken its influence. It has been reported that the President may ask that congress increase the salary of members of the commission and of the shipping board from $7,500 to $10,000 a year.

Because of the fact that the house of representatives after March 4 will be almost evenly divided, recommendations of congressmen with regard to tariff commission give promise of having more influence than they would if there were a strong majority in that branch of congress which originates tariff legislation. The senate majority is also reduced greatly as the result of the election of last Tuesday and not only to be consistent with its favorable attitude toward a tariff commission, would it apparently have to recognize its recommendations, but if the house went on record in favor of tariff revision, the senate probably would not ignore the desire of the lower branch of congress.

Radicals Defeated

In view of the exceptionally close working majority that will exist in the new house for the one party or the other, it seems certain that only conservative legislation can be passed by the next congress in any event, and that, moreover, President Wilson will not seek to pass any other kind. The close electoral vote by which he appears to have been re-elected, it is believed, would be in itself sufficient warning against attempts to take up any kind of radical legislation. It has also been noticed that there were some conspicuous radical candidates who were defeated for re-election. Included among them were Tavenner and Buchanan, of Illinois; Baily, of Pennsylvania, and "Cyclone" Davis and Callaway, of Texas, all Democrats, and strong union labor members of the present house, and also little army and navy advocates. Senator Martine, of New Jersey, also a Democrat and another strong organized labor supporter, was defeated for re-election. It seems obvious, however, that organized labor will make some determined demands on President Wilson in the way of special legislation because of the official support given him by the American Federation of Labor, even though the organized labor vote was but little better controlled at the campaign just ended than it ever has been.

There are those who think it would not be surprising to see a clash between the forces of organized labor and the administration almost at the outset of the next session of congress, because it is said that labor unions are opposed to some of the railroad legislation that the President is prepared to insist on having congress pass next month and which is supported by the railroads. While the prophecy of such a conflict has been made, it may or may not be well founded.

Favors Early Action

The President is said to be anxious to have the tariff commission take up its work as soon as possible, so that it might be ready to submit reports of a comprehensive character before the war ends, so that, if necessary, tariff revision could be brought about in time to meet foreign competition. However, the attitude the President has taken toward probable conditions as to foreign competition after the war has not been entirely satisfactory to the business interests of the country. Chairman Edward N. Hurley, of the federal trade commission; Mr. Hughes, and many others, have insisted that the sharpest kind of competition will prevail after the war. The fact that Mr. Wilson will be serving his second and last term as President, however, has been accepted as putting him in a more independent position than he could assume during his first term.

The legislative program that seems to be in immediate prospect at the second session of the sixty-fourth congress relates to railroad legislation, such as was recommended by the President in connection with the so-called eight-hour law, but failed of enactment, and to the bill legalizing export combinations. This bill needs only to pass the senate, inasmuch as it has passed the house.

Serious Situation

Washington, Nov. 14.—The seriousness of the situation relating to plans for the first year's naval building program is emphasized by the fact that Secretary of the Navy Daniels has arranged for a conference tomorrow with ship builders, whose bids in a majority of cases did not meet the full requirements of the navy department. It is believed that Secretary Daniels has determined to urge the ship builders to go over the requirements once more and, if possible, revise their bids so that they will be direct and come within the appropriations made by congress. As the matter stands, most of the bids are conditional by reason of the labor and material markets, and Mr. Daniels desires to have the conditions eliminated, if this can be done in any possible way without asking too great a sacrifice on the part of the builders. Mr. Daniels will also, it is understood, either directly or through the ship builders, appeal to steel manufacturers in an earnest effort to have them give assurance that they will make expeditious delivery of material for the ships. Steel manufac-

turers have already informed the department that they will see that ship builders are provided with the required steel tonnages. but the objection that has been raised is that the periods of delivery are too extended, and it is hoped that steelmakers will find themselves able to reduce the time. It is recognized that this will call for a sacrifice of much more desirable business from foreign governments and private consumers and it also seems to be a question as to whether it will be physically possible for the steel mills to respond to the urgent request that the department seems prepared to make of them.

The situation has developed to a point where it brings out more clearly than ever the short-sighted policy of the navy department and of congress in not having taken up legislation for an increased building program more than two years ago, when labor and market conditions were favorable.

Various Plans Discussed

Unless Secretary Daniels does succeed in his plan to have the ship builders submit new and unconditional bids which are satisfactory to the department, it is evident that he will have to further delay the building program and turn to congress for relief. He will be compelled either to ask congress to increase the limit of cost it has set on the ships or to permit the ship builders to submit figures on some other basis than that which has been adopted in the past. It might, for instance, be found expedient to allow them to offer to build ships on a basis of cost of construction plus a reasonable profit, as is provided by the present naval act regarding the four battle cruisers, for which bids will be opened on Dec. 6. Moreover, congress might be asked to allow the ship builders to waive the eight-hour law, and other restrictions concerning labor which surround them at present in connection with government work. Present indications are that the ship builders will not find themselves able to revise bids for vessels so that they will in all cases provide for their construction on a direct cost basis. The view has been taken that it would be hazardous for the private yards to offer to build all of the vessels, under present labor and market conditions, upon a basis of direct bids that come within the appropriations made by congress. Various yards have found it impossible to do this in case of some of the ships because they said it would involve serious financial losses. Those that have submitted direct figures did so with the knowledge that if they make any profits, they will be small. While merchant ship building is much more desirable from a financial point of view, the ship builders reserved space in their yards for patriotic reasons, so that they could take care of the government's requirements.

The navy yards are in no condition to take contracts for any appreciable amount of the building program, and for none of the capital ships. It is probable they may take several torpedo boat destroyers and submarines, but no more than that.

Torpedo Boat Destroyers

The only awards that have been made to private yards for the building program include four of the 20 torpedo boat destroyers. These four were given last Friday to the Bath Iron Works, Bath, Me., at $1,150,000 each. The bids for the remaining 16 destroyers, as well as for other new vessels, involved various conditions, Secretary Daniels said, and in many cases contractors were unwilling to meet the full requirements of the department. It was because of this situation that he called the conference of ship builders. In addition to Mr. Daniels, officials of the department who will participate in the conference include Admiral William S. Benson, chief of operations; Admiral David W. Taylor, chief of the bureau of construction and repair, and Admiral Robert S. Griffin, chief of the bureau of steam engineering.

The vessels included in the first year's program, aside from the destroyers named, include four battleships, four battle cruisers, four scout cruisers, 27 coast defense and two sea-going submarines. Bids have been received on all of them except the battle cruisers. It is thought that the bids on all of the battleships, one of the scout cruisers and possibly some of the submarines, may be in such form that awards for them can be made. Reports have it that, if this is done, the Newport News Ship Building & Dry Dock Co., and the New York Ship Building Co., each may get two battleships, the Seattle Construction & Dry Dock Co. one scout cruiser and some of the submarines divided between the Electric Boat Co., and the Lake Torpedo Boat Co. There have been reports that the navy department may possibly be compelled to enlarge its navy yards, perhaps at New York and Norfolk, Va., so that three of the scout cruisers can be built at them. While the reports seem to be unfounded, they denote the exigency of the occasion. It is evident that if the department does have to resort to this improbable plan, the first year's naval program cannot be entirely completed before 1923, a well nigh intolerable situation and one which would be a severe blow at naval preparedness.

Co-operation

Will be Discussed at Meeting of Engineers at Cleveland

The sub-committee on plan, created by the conference on engineering co-operation held in Chicago last April, has been notified by Chairman F. H. Newell of a meeting to be held Nov. 21 in the rooms of The Cleveland Engineering Society. The sub-committee consists of F. H. Newell, chairman; Morris L. Cooke, Hunter McDonald, C. E. Drayer and Isham Randolph. A full attendance is assured, as each member has indicated his intention to be present.

The sub-committee will draft a plan, which has already been drawn in a preliminary form, for submission to the third conference of the committee on co-operation to be called probably in Chicago early in 1917. Every engineering society in the United States will be invited to be represented by a delegate. At the first conference held in 1915 in Buffalo, about a dozen men were present. At the second conference in Chicago, over 40 engineering societies were represented.

At the meeting of The Cleveland Engineering Society on the night of Nov. 21, Mr. Newell and Mr. Randolph will give short talks on subjects relating to co-operation. Mr. Newell will speak on a "Practical Plan of Co-operation", and Mr. Randolph on "What the Established Professional Man Owes to the Engineer". Mr. McDonald will give an address on "Mussel Shoals as a Proposed Location for the Government Nitrate Plant". The Engineering Association of the South has made a study of available locations of this plant, for which congress appropriated $20,000,000, and is prepared to ask other engineering societies to back its recommendation of Mussel Shoals on the Tennessee river in Alabama.

No Rails for Canada

Toronto, Nov. 13.—Notwithstanding the action of the Canadian government in remitting the import duty on steel rails, excepting the war tax, in order to relieve the shortage, very few rails have been secured by the railway companies from the United States. Rails are badly needed, especially in the more recently settled district in the west, to enable the crops to be moved, and the companies have placed large orders in the United States.

News of Employers and Employes

National Industrial Conference Board Formed by Twelve Prominent Associations—Clearing House of Economic Information Will Study Problems Which Confront Manufacturers

AT THE twentieth annual convention of the National Founders Association, in New York, Nov. 15, it was announced that a co-operative body, composed of representatives of national organizations of industrial employers, had been formed under the title of The National Industrial Conference Board for the purpose of providing a clearing house of economic information, a forum for constructive discussion, and machinery for co-operative action on matters that vitally affect the industrial development of the country. The primary purpose in the formation of this conference board is to study the problems confronting the manufacturer in this country; problems which will arise, dealing with changing world conditions, affecting all industries. Heretofore, to a substantial extent, each manufacturer has studied only the problem directly affecting himself, ignoring the fact that all industry is inter-related and that there is a vital need for co-operative action and united effort. The war has brought many new problems, and peace will bring many more. These must be studied and solved.

The conference board will be a clearing house of information. Its purpose will be to analyze and present the essential elements in the situation, suggest methods and inspire united and intelligent action. Industry in this country must have the sympathetic support of the public. It must have the co-operation of the government and it must act intelligently and definitely on its own account. The life of the nation is bound up in its industries and a broad patriotic purpose on the part of manufacturers and employers of labor will bring about increased prosperity and greater prestige for the country itself. There have been times when the public and the manufacturing industries have misunderstood each other; when the manufacturer assumed an antagonism on the part of the public which did not exist; when the public took the position that the manufacturer was indifferent to the public welfare and solicitous only for his own prosperity. Such a situation should never have developed and would not have developed except for the lack of information of each party of the purpose and intent of the other. It is part of the work of this conference board to promote a clear understanding between the employer of labor—the manufacturer—on the one side and the public on the other, and this can be best accomplished by a presentation of actual facts and a public announcement of purpose.

Summarizing the proposition involved, the purpose of the National Industrial Conference Board may be stated as follows:

1. To stimulate the keen interest and active assistance of employers toward constructive study and equitable solution of economic issues in industry.
2. To foster maintenance of harmonious relations between employer and employe and between both and the government.
3. To assist in the formulation and enactment of sound and constructive economic legislation by presenting publicly to legislators the fundamental facts involved in the legislation and their effect.
4. To bring about genuine co-operation between the government and industry so that legislation

National Industrial Conference Board

Frederick P. Fish, Chairman, of Fish, Richardson, Herrick & Neave, Boston.

Magnus W. Alexander, Manager, with General Electric Co., West Lynn, Mass.

MEMBERSHIP AND REPRESENTATIVES

THE NATIONAL FOUNDERS' ASSOCIATION, William H. Barr, president of the Association, president Lumen Bearing Co., Buffalo. Magnus W. Alexander, of General Electric Co., West Lynn, Mass.

THE NATIONAL METAL TRADES ASSOCIATION, W. H. Van Dervoort, president of the association, president Root & Van Dervoort Engineering Co., East Moline, Ill. Herbert H. Rice, with General Motors Co., Detroit.

THE NATIONAL COUNCIL FOR INDUSTRIAL DEFENSE, John Kirby Jr., chairman of the association, president Dayton Mfg. Co., Dayton. James A. Emery, general counsel of the association, Washington, D. C.

THE NATIONAL ASSOCIATION OF MANUFACTURERS, George Pope, president of the association, Hartford, Conn. Shephen C. Mason, secretary McConway & Torley Co., Pittsburgh.

THE NATIONAL ERECTORS' ASSOCIATION, S. P. Mitchell, chairman of the association, president Seaboard Construction Co., Philadelphia. Walter Drew, general counsel of the association, New York, N. Y.

THE NATIONAL ASSOCIATION OF COTTON MANUFACTURERS, A. Farwell Bemis, president of the association, president Bemis Bros. Bag Co., Boston. Albert Greene Duncan, treasurer Harmony Mills, Boston.

THE AMERICAN COTTON MANUFACTURERS' ASSOCIATION. John A. Law, president of the association, president, Saxon Mills, Spartanburg, S. C. Ellison A. Smyth, president Pelzer Mfg. Co., Greenville, S. C.

THE NATIONAL ASSOCIATION OF WOOL MANUFACTURERS, John P. Wood, president of the association, vice president Aberfoyle Mfg. Co., Philadelphia. George C. Hetzel, president George C. Hetzel Co., Chester, Pa.

THE SILK ASSOCIATION OF AMERICA, Charles Cheney, president of the association, treasurer Cheney Brothers, South Manchester, Conn. Robert J. F. Schwarzenbach, of Schwarzenbach, Huber & Co., New York.

THE UNITED TYPOTHETAE AND FRANKLIN CLUBS OF AMERICA, Albert W. Finlay, president of the association, president George H. Ellis Co., Boston. E. Lawrence Fell, president Franklin Printing Co., Philadelphia.

THE AMERICAN PAPER AND PULP ASSOCIATION, Arthur B. Daniels, president of the association, president L. L. Brown Paper Co., Adams, Mass. C. A. Crocker, president Crocker-McElwain Co., Holyoke, Mass.

THE RUBBER CLUB OF AMERICA, Harvey S. Firestone, president of the association, president Firestone Tire & Rubber Co., New York City. Frederic C. Hood, treasurer Hood Rubber Co., Watertown, Mass.

hampering and restricting industry unnecessarily or unjustly may be avoided by a knowledge of the facts.

5. To present to the public facts showing the national benefits of industrial prosperity and the effect on employers and employes and consumers, and to stimulate, by accurate and truthful publicity, intelligent sympathy for all proper efforts for industrial development.
6. To stimulate the employer to maintain good conditions of work; to provide fair treatment for his workers and to take a personal interest in them.
7. To develop among the employes a reasonable attitude towards manufacturers and other industry, to inspire a sense of fair play, efficiency and loyalty.

These proposals are all based on the fact, which is obvious, that in this country there is an enlightened public opinion toward fair-minded progressive employers and reasonable, efficient employes, and that this opinion furnishes a stable foundation on which to build an enduring industrial prosperity.

The essential point in connection with all of this is the purpose of the Conference Board to study every problem and its development, to resolve it, if possible, into its essential facts for the information of the public, of the Government, of labor, and all the members of the various associations represented on the Board.

As a means of carrying these policies into effect, 12 national associations of industrial employers have organized the National Industrial Conference Board. These associations comprise over 15,000 employers, who furnish industrial employment to about 7,000,000 workers in the United States. It is planned to bring other associations of a similar character into the co-operative work until the National Industrial Conference Board will represent fully the progressive industrial movement throughout the country. All members of the board are intimately connected with the industrial development of the nation and bring to their deliberations on vital questions a broad knowledge, practical experience and a full realization of their responsibility. Reinforced by comprehensive study of the questions at issue, their combined judgment is intended to furnish a proper guide for individual and collective action and to serve as a potent force in influencing policies of constituent associations and other organizations of a like character.

The board is developing the necessary machinery through which to utilize this knowledge and experience already accumulated and to enlarge on it by extensive research and study. The scope of the board's work is as broad as the field of the influences which tend to promote or retard industrial progress. The program embraces many intricate problems that demand solution, but these are still within the bounds of practical achievement. The board asks for the co-operation of the government and the public, of its own members, and of the wage earners of the country.

Making Citizens

Edwin S. Denby, former congressman from Detroit and now president of the Detroit board of commerce as well as being a mover in the industrial life of the city, has prepared a paper discussing the work of Americanization, particularly in Detroit, where there now are more than 60,000 non-English speaking workmen.

Mr. Denby says in part:

"The ultimate object in view is the organization of an agency that will oversee the development of the foreigner from the time he arrives in the city, and will provide for the proper education, civic training, his naturalization, and all steps necessary to make him a desirable and competent member of the community.

"Three years ago the appropriation for the public evening school was $35,000; last year it was $65,000, and this year it is $87,500.

"As a result of the first campaign in 1915 by the board of commerce to secure a large attendance of the foreign workingmen at the public evening schools, the attendance at the schools increased 153 per cent and this year the attendance has again increased, in spite of the fact that immigration from Europe is practically at a standstill.

"The result of the campaign to inform the men how to take their citizenship papers and the importance of doing so has been astonishing. From January to June, 1916, there were 5,504 applications for first papers as compared to 2,513 in the same period in 1915. This is a gain of 2,691, or 107 per cent."

Labor Advisor

Birmingham, Eng., Nov. 3.—One of the most far-reaching and new departures of the British government, resulting from the war, has been the appointment of Arthur Henderson as labor adviser to the government. This department already occupies a most important position with large offices and the first occupant of the office, one of the ablest and most moderate of British labor leaders, has the advantage of possessing a great deal of the confidence of business men among employers. It is hoped that when the department gets fairly going it may do something to ward off some of the labor troubles looked forward to as likely to follow the war. It is now announced that with the object of laying the foundation for a regular and definite system of co-operation and communication between industry and the government, consultative committees of employers and trade unionists have been appointed, with a separate consultative committee on women's labor. Other committees will deal with colonial and international problems affecting labor, and with general, social and economic questions.

Hospital Work

The recent issue of *The Modern Hospital* devoted to welfare work in the various industries contains some interesting articles on what has been accomplished along this line by companies engaged in the manufacture of iron and steel. In an article on the Present Scope of Welfare Work in the Iron and Steel Industry, Dr. Thomas Darlington shows how the workshops, household and family as well as the worker have been benefited by the various kinds of welfare work now being carried on in all branches of the iron and steel industry. This issue also contains a number of descriptions of modern industrial hospitals, among which is the new emergency hospital recently built by the Youngstown Sheet & Tube Co., Youngstown, O. Industrial welfare has become so important to all industries that *The Modern Hospital* has decided to devote a number of pages of its magazine each month to the discussion of welfare problems.

The annual Hallowe'en entertainment recently held by employes of the Cutler-Hammer Mfg. Co., Milwaukee, Wis., at Plankinton Hall of the Milwaukee auditorium, was a great success. Vaudeville features included Cutler-Hammer minstrels, mandolin club, wire walker, juggler, and also the Ham-Tree sextet and Cherry sisters. After the entertainment, dancing was enjoyed in another hall of the auditorium. The proceeds will be used to pay part of the expenses of the annual Christmas party.

Iron and Money: Fact and Comment

Steel Shares Hold Their Own in Post-Election Market, Despite Victory of President Wilson—Gulf States Steel Makes Spectacular Advance—Some Extraordinary Performances

ELECTION day has come and gone and the steel trade moves along in much the same old way—as was to be expected. As a whole, leaders of the steel trade are and always have been emphatically Republican. A large majority of them favored the election of Mr. Hughes. But the present steel market is not a condition to be affected by political sentiment. Mills now are concerned with the pressing problems arising from a shortage of steel. They are trying to book as much of the most desirable foreign business as possible and at the same time care for the needs of their regular customers. They are pushing production to the last ounce, trying to make deliveries on orders already placed. The labor shortage and the acute car situation are flies in the ointment giving increasing annoyance to the steel trade. It is these things which are influencing the iron industry's mental attitude, rather than the more abstruse problems of what is going to take place after the war, or before that time, in politics.

The stock market, on the other hand, is a more sensitive institution. Like the steel trade, it favored the election of Mr. Hughes. Furthermore, it was so certain that its choice would win that odds on Hughes and against Wilson were offered for months before Nov. 7. But Wall Street's guess went wild, for the first time since 1856, if the Hayes-Tilden controversy of 1876 be excepted.

The action of the stock market itself during the week was extraordinary in the extreme. It reflected a strange mixture of underlying strength and disappointment over the outcome of the election. On the day preceding election the market advanced with sales of 1,500,000 shares. Late Tuesday night, when a victory for Hughes seemed assured, a huge volume of buying orders was placed with New York brokers. On the day following, prices advanced sharply at the opening, then moved confusedly up and down. This was done, of course, to the disconcerting uncertainty as to who had been elected president. On Friday, however, when Mr. Wilson's victory was conceded on practically all sides, business actually exceeded 2,000,000 shares, with evident conflict of powerful tendencies reflected in confused price movements. There is no question, however, that if Mr. Hughes had won, an old-fashioned post-election boom in stocks would have taken place.

Steel shares for the most part held their own or registered trifling advances, with here and there spectacular advances, such as that made by Gulf States Steel. Significant losses were lacking, although the nation had decided to retain for another four years an administration which has had decided low tariff views. Quotations on a number of iron, steel and industrial stocks at the close of the New York stock exchange Nov. 11 and net changes for the preceding week follow:

	Close Nov. 11.	Net chg.
American Can	63½	.....
American Can, prfd.	115	+1½
Amer. Car & Fdy.	70¼	+ ¾
Amer. Car & Fdy., prfd.	117	—1⅜
American Locomotive	94¼	+3½
American Locomotive, prfd.	109	+ ½
American Steel Foundries	65½	+1½
Baldwin Locomotive	85⅞	—1¼
Baldwin Locomotive, prfd.	106⅛	— ¾
Bethlehem Steel	665	—13
Bethlehem Steel, prfd.	152	+2
Colorado Fuel & Iron	54	+ ¾
Continental Can	101	—2⅞
Continental Can, prfd.	113	.....
Crucible Steel	90	—2⅛
Crucible Steel, prfd.	124¼	+1¾
General Electric	179⅜	—2⅛
Gulf States Steel	133	+38
Gulf States Steel, 1st prfd.	103	+2
Gulf States Steel, 2d prfd.	129	+33
Internat'l Harv. of N. J.	117⅞	+ ⅜
International Harv. Corp.	80	+2
Internat'l Harv. Corp., prf.	111	+1
Lackawanna Steel	95½	+6½
Nat'l Enamel'g & Stmp. Co.	32¼	+1½
Nat'l En. & Stmp. Co., prf.	99	+1¾
Pressed Steel Car	78¾	+4⅜
Pressed Steel Car, prfd.	105½	+1½
Pullman Palace Car	169¾	+1¾
Republic Iron & Steel	80¾	+2⅞
Republic Iron & Steel, prfd.	115⅛	+ ⅝
U. S. C. I. P. & Fdy. Co.	25	— ⅛
U. S. C. I. P. & F. Co., pr.	67	+4½
United States Steel	122¾	+2⅝
United States Steel, prfd.	121¾	+ ⅞
Westinghouse Mfg. Co.	64⅞	—1

Maximum quotations for a number of leading iron and steel securities not listed on the New York stock exchange, as of Nov. 10 and Nov. 3, compare as follows:

	Nov. 10.	Nov. 3.
American Radiator	420	...
American Ship Building	72	72
Cambria Steel	140	140
Chicago Pneumatic Tool	73	73½
La Belle Iron Works	81¾	79
Lake Superior Corp'n	28⅝	33⅛
Stewart-Warner Speed. Co.	111½	113
Warwick Iron & Steel	10	9⅞
Westinghouse Air Brake	155	156½
Westingh'se Elec. & Mfg. Co.	67½	67¾

Financial Crop Ends

The United Motors Corporation, Detroit, has bought another company, bringing the total number owned by this concern to nine. The latest purchase is the Houk Mfg. Co., Buffalo, manufacturer of wire wheels. The Houk company will continue as a separate manufacturing organization. The plant's capacity will be doubled. Output now is 2,200 wheels a day, but will be 4,500 by Feb. 1, according to plans.

* * *

Controling interest in the ownership and management of the Champion Stove Co., Cleveland, passed Nov. 1 to A. B. du Pont and Fred C. Alber, who have become secretary and treasurer of the new board of directors. C. H. Miller, president, and John A. Herbst, secretary-treasurer, have sold their interests and have retired from the business. The new management proposes to broaden the scope of the business and increase the output.

* * *

Directors of the Paige-Detroit Motor Car Co., Detroit, have called a special meeting of the stockholders for Nov. 20 to consider a preferred stock issue of $1,500,000. This would increase the capital from $2,000,000 to $3,500,000. It is announced that this issue is apart from the proposed issue of the same amount that was to be considered at a special meeting called for Sept. 23 and adjourned from time to time, finally to Nov. 24. The meeting for Nov. 24 will be adjourned sine die, without action.

* * *

Good demand for Thomas Iron Co. stock has been evident in the outside market at Philadelphia the past few days. Offers of $25 to $26 have been made, while $30 has been asked. Meetings were held last week by the committees negotiating the sale of the company under the recent offer of the Bilyeu syndicate to purchase the property for $3,500,000 cash. It is reported that progress is being made toward the consummation of the sale. The stock has risen from $16 a share a few weeks ago.

* * *

Capital stock of B. F. Avery & Sons, Louisville, Ky., plow and farm implement manufacturers, has been fixed at $2,300,000. Series A of preferred stock, amounting to $200,000, is to be retired, and a series to be known as A 1, preferred stock, consisting of 7,000 shares at $100 a share, totaling $700,000, is to be issued to pay 7 per cent a year. Another series of preferred stock, in the sum of $600,000, with shares at $100 each, is to be issued. This stock will pay 6 per cent dividends.

The company will issue 10,000 shares of common stock at $100 a share, totaling $1,000,000. The total amount of indebtedness at any one time shall not exceed $2,500,000.

* * *

Gulf States Steel common stock advanced 38 points on the New York stock exchange last week. This noteworthy rise is attributed directly to the phenomenal earnings of this Birmingham company. In October profits amounted to $335,000, after all charges for depreciation, taxes and reserves, or at the rate of 73 per cent on the common stock. This was an increase of $106,000 over September. For the 10 months to Nov. 1, net income from operations amounted to

$1,945,000, compared with $451,000 for the same period in 1915. The company has three classes of stock totaling $11,000,000 outstanding. In less than a year of the present buoyant steel market, all three classes have been placed on a dividend basis at the rate of 7 per cent on the $2,000,000 first preferred, 6 per cent on the $4,000,000 second preferred, and 8 per cent on the $5,000,000 common. The company has no bonds. At the close of last week, Gulf States common was quoted 133, second preferred 129 and first preferred 103. No reason is apparent for the gap between common and second preferred, as the second preferred is convertible into common at the option of the holder.

Highest Point

Ever Touched by Unfilled Orders of Steel Corporation

Despite its tremendous shipments which were the largest of any month in its history, the Steel Corporation during October was able to add 492,676 tons to its volume of unshipped business and to bring its unfilled orders as of Oct. 31 to 10,015,260 tons, the highest point on record. The last previous high mark of unshipped orders was at the end of May, when a total of 9,937,798 tons was shown. The bookings on hand Sept. 30 were 9,522,584 tons. The large volume of new business taken in October is attributed to the heavy buying of car and ship material, of rails for 1918 and to liberal export orders.

The unfilled orders of the Steel Corporation at the close of each month in recent years, showing the changes in tonnage and per cent are as follows:

Date.	Total.	Change, tonnage.	Change, per cent.
Oct. 31, 1916....	10,015,260	492,676+	5.18+
Sep. 30, 1916....	9,522,584	137,133—	1.42—
Aug. 31, 1916....	9,660,357	66,765+	.69+
July 31, 1916....	9,593,592	46,866—	0.48—
June 30, 1916....	9,640,458	297,340—	3.09—
May 31, 1916....	9,937,798	108,247+	1.11+
Apr. 30, 1916....	9,829,551	498,550+	5.34+
Mar. 31, 1916....	9,331,001	762,035+	8.89+
Feb. 29, 1916....	8,568,767	646,199+	8.16+
Jan. 31, 1916....	7,922,767	119,547+	1.53+
Dec. 31, 1915....	7,803,220	616,731+	8.58+
Nov. 30, 1915....	7,189,489	1,024,037+	16.63+
Oct. 31, 1915....	6,165,453	847,834+	14.06+
Sep. 30, 1915....	5,317,618	409,163+	8.13+
Aug. 31, 1915....	4,908,455	20,085—	0.04—
July 31, 1915....	4,928,640	250,344+	5.35+
June 30, 1915....	4,678,196	413,598+	9.69+
May 31, 1915....	4,264,598	102,354+	2.46+
Apr. 30, 1915....	4,162,244	93,505—	2.21—
Mar. 31, 1915....	4,255,749	89,622—	2.06—
Feb. 28, 1915....	4,345,371	96,800+	2.28+
Jan. 31, 1915....	4,248,571	411,928+	10.74+
Dec. 31, 1914....	3,836,643	512,051+	15.40+
Nov. 30, 1914....	3,324,592	136,505—	3.94—
Oct. 31, 1914....	3,461,097	326,570—	8.62—
Sep. 30, 1914....	3,787,667	425,664—	10.01—
Aug. 31, 1914....	4,213,331	54,742+	1.32+
July 31, 1914....	4,158,589	125,732+	3.12+
June 30, 1914....	4,032,857	34,697+	0.86+
May 31, 1914....	3,998,160	278,908—	6.98—
Apr. 30, 1914....	4,277,068	376,757—	8.09—
Mar. 31, 1914....	4,653,825	372,615—	7.42—
Feb. 28, 1914....	5,026,440	412,760+	8.95+
Jan. 31, 1914....	4,613,680	331,572+	7.74+
Dec. 31, 1913....	4,282,108	114,239—	2.59—
Nov. 30, 1913....	4,396,347	117,420—	2.60—
Oct. 31, 1913....	4,513,767	490,018—	9.79—
Sep. 30, 1913....	5,003,785	219,683—	4.24—
Aug. 31, 1913....	5,223,468	175,888—	3.03—
July 31, 1913....	5,399,356	407,965—	7.03—
June 30, 1913....	5,807,317	517,005—	8.18—
May 31, 1913....	6,324,322	654,440—	9.38—
Apr 30, 1913....	6,978,762	490,194—	6.55—

Coke By-Products

Spot Benzol Still Irregular Owing to Resale Offerings

New York, Nov. 14.—No changes of importance have developed in leading coke oven by-products during the past week. In pure benzol, buyers, apparently, have more faith in the stability of prices for future deliveries and contracts are being closed for the full year of 1918. Some buyers, however, still are holding off. Spot benzol remains irregular due to the numerous resale offerings, some of which are going at concessions from 55 cents, which leading sellers are asking. There is more talk than action regarding toluol contracts for 1918, but as a considerable fraction of the estimated output for 1918 has been taken up, producers are patiently awaiting the development of present inquiries. Contracts remain around $2 per gallon. As low as $2.25 on spot, and as high as $3, are reported. The government inquiry for 150,000 gallons of toluol will be bid upon Nov. 20. Phenol for future delivery is offered in liberal quantities, but practically all the buying is for spot shipment, for which only limited supplies are available. Spot is firm at about 55 cents per pound, while contract prices are nominal. Solvent naphtha continues weak with prices standing from 25 to 30 cents per gallon.

Another advance of 2 cents per 100 pounds, to $3.88 to $3.90, tidewater, was made this week by sellers of sulphate of ammonia. The market continues to tighten steadily because of the limited supplies available for early delivery and of the heavy demands for such positions. Producers are obliged to reject considerable business constantly.

Market Prices for Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.	
Pure benzol	$0.55
Toluol	2.25 to 3.00
Solvent naphtha	.25 to .30
Per Pound at Producers Plant.	
Phenol	.55
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$3.88 to 3.90

Contract.

Per Gallon at Producers Plant.	
Pure benzol	$0.55 to .60
Toluol	2.00 to 2.25
Solvent naphtha	.25
Per Pound at Producers Plant.	
Phenol (nominal)	$0.50
Per 100 Pounds at Seaboard.	
Sulphate of ammonia (nearby)	$3.88 to 3.90

The Union Electric Steel Co., Pittsburgh, recently incorporated in Delaware with a capital stock of $350,000, has purchased a site at Carnegie, Pa., adjoining the plant of the Alloys Steel Forging Co. and has awarded contracts for the erection of a plant. A 6-ton heroult electric furnace is being built at the plant of the American Bridge Co., at Ambridge, Pa., and the company expects to be making steel by April 1.

James D. O'Neil, formerly president of the United Coal Co., Pittsburgh, is president of the new concern; the secretary is H. O. Murphey, Keystone building, Pittsburgh, and the plant manager will be W. J. Walker, formerly connected with the open-hearth steel departments of the American Steel & Wire Co. at the Schoenberger Works, Pittsburgh, and the Donora Works, Donora, Pa. Until recently, Mr. Walker was identified with the Universal Rolling Mill Co., Bridgeville, Pa., as manager of the electric furnace department.

New Foundry

For Cleveland Stove Company—Entire Plant to be Moved

Plans for a new foundry, to be erected for the Cleveland Co-Operative Stove Co. have been drawn up by the George Rider Co., structural engineers. The contract has been let to the Penn Bridge Co., Cleveland, and work on the site on Harvard avenue will be started immediately.

The present foundry, located on East Sixty-second street and Central avenue has proved to be inadequate to the needs of the company. The new plant will be one-story, of brick and steel construction, and it is estimated will cost approximately $125,000. About 400 tons of steel will be used in its construction. Sidings connecting the new plant with the Newburgh & South Shore railroad have already been placed. The company hopes to have the new plant completed by the early part of February. The building site is about 250 x 900 feet. The dimensions of the foundry will be 130 x 450 feet, but it is expected that the building will later be extended to the entire length of the lot, making it 900 feet long. The company plans eventually to move its entire equipment to the new location.

A Pond truss roof with steel sash, will be used, thus insuring good facilities for ventilation. The core ovens will be situated at the extreme end of the foundry. An 84-inch cupola will be erected on one side of the center section. The molding floors, 60 feet wide, will run the length of the foundry and will be separated by a 15-foot gangway. The storage bins on the charging floor will accommodate a week's supply of materials for the cupola.

Joseph McGhee, attorney general elect of Ohio, is secretary and director of the Wellston Iron Furnace Co., Wellston, O.

Market Eases Off After Mauling

Small Orders Rule in Several Tool Centers While Good Inquiries are Pending Elsewhere—Preparedness Program May Mean Big Business for Eastern Builders—Prices on Drill Presses Raised

BUYING in the machine tool market is on a reduced scale compared with that of the last two or three weeks, but the situation still is one of activity. Small orders are coming out in greater volume and a great deal of additional buying is in prospect for the near future. One of the most active buyers in the east is the General Electric Co. This company is distributing orders for a few tools almost daily, so that the total requirements it is placing each week involve a large outlay. The Bethlehem Steel Co. has bought a number of additional machine tools for its Sparrows Point, Md., plant, and it is expected that additional requirements for this plant will be placed shortly. The government has placed orders for sonsiderable equipment for various navy yards. The Ames Ship Building & Drydock Co., Seattle, Wash., has ordered some additional equipment, thus practically completing its purchases. The Standard Ship Building Corporation, 44 Whitehall street, New York, has not yet made any purchases on its large list of tools. The Birdsall Engine Co., Auburn, N. Y., is in the market for some shearing machinery. The Missouri, Kansas & Texas railroad has purchased a fairly large list of tools to be installed in its various shops. The Pennsylvania Lines West have placed some business and have taken bids on additional tools. The New York, New Haven & Hartford railroad has taken bids on the list of combination punch and shears and other tools on which it recently inquired, and it is expected that this equipment will be placed shortly. Prices on high-speed drill presses were advanced 12½ per cent Nov. 10, making the quotations on these tools about 25 per cent higher than they were two years ago. An advance notice regarding the change was sent out to the trade, with the result that a large number of these tools was sold before the increase became effective. Prices on ordinary upright drill presses also have been advanced about 10 per cent, making these quotations about 25 per cent higher than they were two years ago. An interesting development which is believed to forecast considerable buying of machine tools, is the recommendation by the special board appointed by secretary of war Baker that the government immediately purchase 4,600 machine guns, of the type manufactured by the Colt's Patent Firearms Mfg. Co., Hartford, Conn. It is understood that a contract for these guns will be let without delay, since the necessary money already has been appropriated. The board also recommends that in case of war, the government purchase "all Vickers machine rifles that the Colt's Patent Firearms Mfg. Co.; all Lewis rifles that the Savage Arms Co. and all Colt rifles that the Marlin Arms Corporation can make until the total quantity required is procured."

The demand for turret lathes has fallen off recently and these machines now can be bought for immediate shipment. Although there are plenty of single purpose lathes available, the standard makes of lathes are pretty well sold up in the small sizes, and 14, 16 and 18-inch machines cannot be had in quantities for delivery prior to June or July. Better deliveries now can be had on 20-inch and larger lathes. Shapers are scarce, being sold up to March or April. Plain and universal milling machines are sold up to June or July and radial drills are sold ahead till January or February. Planers are scarce in all sizes. The demand has been chiefly for sizes larger than 33 inches, so that the production of smaller sizes has been curtailed. It is difficult to secure planers, particularly in the larger sizes, for delivery before six months. Hand screw machines are obtainable for immediate delivery. Cold saws now are easier to get. High speed drills can be had for delivery within four or five weeks, and upright drills can be had for delivery in about four weeks. Universal grinders are scarce, being sold up to April, and automatics are sold up five or six months ahead.

The McMyler Interstate Co. has taken contracts for a 120-ton, fitting-out crane for the Sun Ship Building Co., Chester, Pa., and for a car unloader for the Central Railroad of New Jersey at Jersey City, N. J. The Beacon Light Co., Philadelphia, has ordered one 120-ton and one 25-ton Niles crane for installation in a new power plant to be erected at Chester, Pa. The Lukens Iron & Steel Co. is inquiring for four 30-ton overhead cranes. The Atlantic Refining Co., Philadelphia, is in the market for four 2-ton wall cranes.

The Lightwell Steel Sash Co., Du Pont building, Wilmington, Del., is preparing to locate a plant at Newport, Del. The Metal Package Co., Brooklyn, is about to extend its capacity. The Commercial Electrolytic Co., is to occupy a new plant shortly. The New Brunswick Iron Works, New Brunswick, N. J., is about to erect a new foundry. The Crucible Steel Co. of America is about to extend its plant at Harrison, N. J. The Erie City Iron Works, Erie, Pa., will erect a large new cleaning and storage room. The Providence Base Works of the National Lamp Works, Providence, is about to erect a large new plant. The Merrow Machine Co., Salem, Mass., is about to build a new machine shop. The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., is about to build two plant additions. The Budd Wheel Corporation, Philadelphia, recently incorporated, is about to build a plant in Philadelphia, to manufacture wire automobile wheels. The Silvertown Cycle Co., Worcester, Mass., just organized, is to erect a large new plant for manufacturing bicycles. The Rathbone-Sard Electric Co., Albany, N. Y., recently was organized to take over the plant of the Interstate Storage Co., will manufacture electric ranges. The Advance Machine Co., Cambridge, Mass., is locating in a new building. The Leland-Gifford Co., Worcester, Mass., is about to double its capacity.

Small Orders Rule in Chicago

A STEADY inquiry and buying of machine tools continues. The volume of business is large and is made up of small lots. One result of the steady demand is that deliveries, that had been much easier for a few weeks, have receded. The earliest ship-

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CLEVELAND OFFICE—Hickox Building. The Hamill-Hickox Co., District Representative
CHICAGO OFFICE—Room 1511-12 Lytton Bldg.
14 East Jackson Blvd., Mr. A. Schaeffer,
District Representative
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ment that can be obtained on standard tools is May and the range is from May until October. It seems probable from the attitude of buyers and the pressure for early delivery the present buying is only for pressing needs. It has been recognized for some time that much equipment is not being bought because of high prices and long delay in delivery. The Chicago, Milwaukee & St. Paul railroad has put out a small list which appears on page 1022 of this issue. The Pennsylvania railroad is understood to have issued a list of tools for its Fort Wayne shops.

Heavy Buying in Prospect

PITTSBURGH machine tool dealers are enjoying a continued heavy demand for all types of equipment. Pending inquiries involve a diversified line of machinery and dealers say they believe the market will be even more active before the end of the month. Builders of heavy rolling mill equipment are literally swamped with business. Demand for cranes has not fallen off. The Cleveland Crane & Engineering Co., Wickliffe, O., has received orders for two 20-ton cranes for installation in the Josephine, Pa., plant of the Marshall Foundry Co. and one 25-ton crane for the Midland, Pa., plant of the Pittsburgh Crucible Steel Co.

Good Inquiries Pending in Cleveland

A NUMBER of good inquiries have been received by machine tool dealers in the Cleveland territory. The American Ship Building Co., Cleveland, is still in the market for equipment. The United States Cast Iron Pipe & Foundry Co. is in the market for machine shop equipment for an addition at Addystown, O. Lampson & Sessions have taken over the plant of the Cleveland Wrought Washer Co., Cleveland, and are in the market for a number of tools. The Morgan Engineering Co., Alliance, O., is in the market for a Dietrich & Harvey or equivalent, horizontal floor boring machine with a 6-inch bar and one only Dietrich & Harvey or equivalent horizontal floor boring machine with a 5-inch bar. This company also requires two 6-foot radial drills, one keyseating machine with vertical attachment for rounding out the end of the keyway, and one 48-inch x 22-foot Ingersoll slab milling machine with one head and cross rail, one side head, motor driven, power cross-feed in all directions. The Morgan company is also inquiring for one 48-inch x 48-inch x 20-foot planer, one 60-inch x 60-inch x 20-foot planer, and one 120-inch x 120-inch x 26-foot planer, all with double housing, direct motor drive, two heads and cross rail, two side heads equipped with power feeds. Warner & Swasey, Cleveland, are in the market for some equipment. The Fort Smith & Western railroad, Fort Smith, Ark., is in the market for second-hand lathes, 16, 18 or 20-inch swing with 6-foot bed. W. F. Davis, 149 Broadway, New York City, is handling an Italian inquiry for machine tools and it is said that about 600 machines will be purchased. Radial drills, planers, shapers, cylindrical grinders and milling machines are occupying the center of the stage and deliveries on these machines continue to lag. A number of large orders from Detroit have been placed recently with Cleveland dealers. Strong, Carlisle & Hammond, local dealers, have been awarded a contract for $52,000 worth of screw machines for a Detroit manufacturer.

Deliveries Picking Up in Cincinnati

A CINCINNATI lathe manufacturer has caught up on deliveries and can now deliver six lathes one week from the time the order is placed, and 25 lathes within a month. Deliveries on milling machines cannot be made within two or three months, since the demand for these machines is fully as heavy now as for lathes. Portable grinders and drilling machines have been selling in large lots recently, principally because good deliveries can be guaranteed. A Cincinnati manufacturer who recently returned from a business trip through the eastern states reports that he was surprised to find large quantities of machine tools stored in warehouses in New York and elsewhere which have not been sold. The Carlton Machine Tool Co., Cincinnati, will need considerable equipment for its new plant. The Peerless Foundry Co., Indianapolis, will need foundry equipment for a new plant 90 x 212 feet.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

Among New England Factories

BATH, ME.—The Texas Steamship Co., 17 Battery place, New York, contemplates erecting three more ship ways, making a total of five, and a machine shop.

GREAT FALLS, N. H.—The Berwick & Salmon Falls Electric Co. has let contract for erecting power plant to cost about $100,000.

RUTLAND, VT.—The F. R. Patch Mfg. Co., maker of shrapnel shells, will rebuild that part of its plant recently damaged by fire. It will be of brick and steel, 1-story, 64 x 140-foot, to be used as a machine and blacksmith shop.

SALISBURY, VT.—The Addison Electric Co. is having plans prepared for a new hydroelectric plant.

ALLSTON, MASS. — The Albany Carpet Cleaning Co., Boston, will build a brick, 1-story, 45 x 95-foot factory on Penniman road.

BOSTON.—The F. J. Van Etten Co. has been incorporated to do general engineering and contracting with $10,000 capital by J. H. Van Etten, president; Frederick J. Van Etten, treasurer and T. F. Casey Jr.

BOSTON.—The New York, New Haven & Hartford railroad will widen the cut leading through South Boston, for four tracks, lengthen 11 bridges and build retaining walls at a cost of $800,000.

BOSTON.—The American Tool & Machine Co., Hyde Park, has let contract for erecting 2-story, 50 x 60-foot blacksmith shop.

BOSTON.—The Boston Ship Building Co. has been incorporated with $4,000 capital by William E. Dingwell, president; James I. Green, treasurer and A. Dingwell.

BOSTON. — The Boston Fabricating Co. has been incorporated with $10,000 capital by E. J. Sanderson, president; Thomas M. Spelman, treasurer and A. M. Monahan.

BOSTON.—The 195 Commonwealth avenue

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SHELBY OHIO

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Trust will build a brick and stone fireproof, 7-story, 28 x 104-foot hotel at Commonwealth avenue and Exeter street.

CAMBRIDGE, MASS.—The Advance Machine Co. has leased a 53 x 106-foot building at 37 Osborn street and will occupy two floors. The company manufactures special embossing machines.

CAMBRIDGE, MASS. — The Robertson-Northrop Co. has been incorporated to manufacture telephone appliances, etc., with $50,000 capital by H. B. Northrop, president; Edward F. Robertson, Boston, treasurer, and George H. Mellen.

CHELSEA, MASS.—Morris Broomfield, 146 Franklin avenue, has let contract for the erection of 1-story, 60 x 85 x 16-foot foundry.

CHELSEA, MASS.—A permit has been issued to the Mexican Petroleum Co. to build a concrete, 1-story manufacturing building to cost $375,000 on Eastern avenue.

EVERETT, MASS. — The General Electric Co. will build a 1-story, 200 x 115-foot pattern shop at the foot of Tileston street.

GARDNER, MASS.—The Boston & Maine railroad will build a wood and concrete, 1-story, 40 x 500-foot freight house and a 600-foot platform on Conant street, to cost $150,000.

GARDNER, MASS. — The Gardner Paper Co. has been incorporated with $250,000 capital and will erect a mill on the Whalen property of 23 acres with a capacity of 80,000 pounds of paper a day.

HOLYOKE, MASS.—The Valley Paper Co. will build a brick, 3-story, 60 x 227-foot mill on Bridge street.

LAWRENCE, MASS.—John W. Bolton & Sons, have been incorporated to deal in iron, steel, etc., with $125,000 capital by John W. Bolton, president and treasurer; William W. Bolton and A. L. Bolton.

LEE, MASS.—The producing plant of the Standard Lime Co. was damaged by fire with a loss of $50,000.

LEICESTER, MASS.—The Valley woolen mill will build a brick, mill construction, 2-story, 58 x 206-foot addition to its weave shed.

LEOMINSTER, MASS. — The government will build a post office building to cost $70,000 at Main street and Merriam avenue.

MALDEN, MASS.—Henry Carmichael has awarded the contract for a brick, 3-story, 40 x 100-foot factory at Centre and Abbott streets, to cost $25,000, which will be occupied by the N. & H. Shoe Co., Chelsea, Mass.

MANSFIELD, MASS.—The New England Drawn Steel Co., recently organized with $250,000 capital, is starting the erection of a plant which is to be completed within three or four months.

NEW BEDFORD, MASS. — The Holmes mill will build a brick, mill construction, 1-story, 100 x 312-foot addition for its mercerizing department to cost $100,000.

NORTH ADAMS, MASS.—The Berkshire Hills Paper Co. has awarded a contract for a 1-story addition to its paper machine room, to cost $20,000.

PITTSFIELD, MASS.—The General Electric Co. will build three additions to factory No. 7, which will be of brick, steel and reinforced concrete, 1-story and basement, 75 x 175 feet each.

RAYNHAM, MASS. — The Specialty Nail Co. is beginning work on a 2-story, 50 x 150-foot manufacturing addition.

SPRINGFIELD, MASS. — The Fiberloid Co. has let contract for 50 x 155-foot machine shop.

SPRINGFIELD, MASS.—The Perkins Appliance Co. has been incorporated to manufacture steel, iron and other metals with $50,000 capital by J. L. Perkins, president; Harry R. Elder, treasurer, and R. S. Miles.

WORCESTER, MASS.—The Worcester Gas Light Co. will build a brick and steel, 1-story, 31.3 x 40.6-foot addition to its plant at 5 Quinsigamond avenue.

WORCESTER, MASS.—The Leland-Gifford Co., crankshafts and drills, which recently completed a plant here and now employs about 450 operatives, is about to double its capacity. It will erect a 4-story, 62 x 102-foot building which will have a 4-story, 62 x 124-foot wing.

WORCESTER, MASS.—A company is in the process of organization to erect a plant here which will have capacity for turning out about 100,000 bicycles a year. Wm. P. Farrell, of J. W. Grady & Co., Worcester, will be vice president and general manager.

MELVILLE, R. I.—The government will build a corrugated iron and steel, fireproof, 2-story, 48 x 192-foot torpedo storage building to cost $25,000 at the naval coaling station.

NEWPORT, R. I.—The Hotel Dinsdale and a garage adjoining were damaged $50,000 by fire.

PAWTUCKET, R. I.—The Jencks Spinning Co. will build a brick, 45-foot high, 100 x 100-foot power plant on Weedon street.

PAWTUCKET, R. I.—The Pawtucket Hosiery Co. will build a brick, mill construction addition to its plant on Rand street, Central Falls, R. I.

PROVIDENCE, R. I.—The Grocers Baking Co. will build a brick, 1 and 2-story, 100 x 126-foot building on North Main street.

WOONSOCKET, R. I. — The Fairmount Foundry is about to erect an addition.

BRIDGEPORT, CONN.—Hunter & Havens will build a steel warehouse on Silliman's lane, enlarge their yards and install a spur track.

BRIDGEPORT, CONN.—The W. P. Kirk Co. has awarded the contract for a brick, 3-story, 110 x 130-foot store and factory building to cost $75,000 on Main street.

BRIDGEPORT, CONN. — The Karn Terminal Co., recently organized with a paid-in capital of $200,000, proposes to erect a coke oven plant here.

HARTFORD, CONN.—The National Pipe Cleaning Co. has been incorporated with $50,000 capital by M. A. Thorpe, president; Thomas E. Canfield, treasurer, and Edward T. Canfield, secretary.

HARTFORD, CONN. — The Billings & Spencer Co., manufacturer of drop forgings and tools, has commenced work on the erection of a 2-story 69 x 112-foot plant extension.

HARTFORD, CONN. — The Capitol File Co. has been incorporated with $50,000 capital by Stephen Moskey, president; Matthew F. Moskey, vice president; Theodore E. Clark, secretary and treasurer and Benjamin J. Moskey, assistant treasurer and assistant secretary.

MIDDLETOWN, CONN.—The New England Enameling Co. has let a contract for the erection of a plant here.

NAUGATUCK, CONN.—The Goodyear Metallic Rubber Shoe Co. will build a brick, 5-story and basement factory.

STRATFORD, CONN. — The Bridgeport Steel Co. has been incorporated with $100,000 capital by Clarence R. Hall, John F. L. Hubbard and Mabelle K. Pedersen.

WATERBURY, CONN.—The Scoville Mfg. Co. has started to erect two new manufacturing buildings, 125 x 220 and 50 x 170 feet, respectively.

From the Alleghenies to the Sea

BUFFALO.—The King Sewing Machine Co. has plans in progress for a 1-story addition.

BUFFALO.—The Buffalo Foundry & Machine Co. has completed plans for a 1-story 34 x 110-foot machine shop.

BUFFALO.—Col. F. G. Ward, chairman of the board of public works, is receiving bids for constructing a bascule bridge across the Buffalo river at Abbott road.

BUFFALO.—The Transmission Ball Bearing Co., W. J. Murray, president, has plans in progress for a 1 and 2-story manufacturing building.

BUFFALO. — The Kelley Island Lime & Transportation Co., Cleveland, has plans in progress for a 1-story, 50 x 188-foot manufacturing building to be erected at a cost of about $250,000.

FAIRPORT, N. Y.—The American Can Co. has let contract for building 3-story, 75 x 180-foot manufacturing and warehouse addition to its plant here.

GENEVA, N. Y.—The Geneva Cutlery Co. has let contract for erecting plant addition.

JAMESTOWN, N. Y.—The Steel White Co. has been incorporated with a capital of $200,000 for the manufacture of metal household goods by devices patented by Otho M. Otte, general manager of the Jamestown Interior Mfg. Co. V. S. Ehrhart, Norwood Johnson, Julian Burdick, George L. Craig, James Lippincott and James W. Arrott Jr., all of Pittsburgh, are interested in the company.

NORWICH, N. Y.—The Norwich Wire Basket Co. has let contract for 1-story, 75 x 192-foot plant addition.

POUGHKEEPSIE, N. Y. — Moline Plow Co. will build 1-story, 60 x 100-foot foundry addition here.

ROCHESTER, N. Y.—R. T. French Co. has plans in progress for a 2-story manufacturing addition.

MILVILLE, N. J.—The Milville Mfg. Co. has plans in progress for a 1 and 2-story, 200 x 300-foot manufacturing plant.

NEWARK, N. J.—The Oxweld Acetylene Co., 646 Freylinghuysen avenue, has let contract for a 1-story, 44 x 45-foot brass foundry.

NEWARK, N. J.—The American Synthetic Dyes Inc., is about to erect three additional buildings at its plant on the Passaic river near the Newark transfer station. They will include a 1-story pumping station and an auxiliary boiler house.

ARDMORE, PA.—Bids are being taken on the construction of an 80 x 100-foot repair shop addition to be built here by the Autocar Co.

CHESTER, PA.—The Beacon Light Co. has let a contract for the construction of a large

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OAK HILL, OHIO

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power plant to the Chester Construction & Contracting Co. The building, six stories, 300 x 420 feet, will cost about $2,500,000, while the total outlay for the new plant will be about $6,000,000.

NEW CASTLE, PA.—The Pulimore Motor Truck Co., recently incorporated with $100,000 capital, has awarded a contract for the first unit, 100 x 500 feet, to its new plant to the Samuel Austin Co., Cleveland, according to an announcement made by J. R. Redeker, Frick building, Pittsburgh.

NEW HOLLAND, PA.—E. L. Roseboro is about to build a 1 and 2-story, 40 x 107-foot carriage factory.

PHILADELPHIA.—The Belmont Packing & Rubber Co. has let contract for 1-story and basement, 66 x 70-foot manufacturing addition.

PHILADELPHIA.—The Frankford Arsenal has received bids for the construction of a 2-story, 38 x 43-foot addition to its lead shop.

PHILADELPHIA.—Bids are being taken on the construction of a 1-story, 37 x 146-foot machine shop at Broad street and Hunting Park avenue for John H. Ferguson.

PHILADELPHIA. — The Philadelphia Enamel Mfg. Co. in which John Kennedy, 1001 Chestnut street, is interested, will build a 1-story, 120 x 200-foot plant.

PHILADELPHIA. — Wm. Cramp & Son Ship & Engine Building Co. has let contract for erecting two 3-story, 60 x 150-foot shop additions.

PITTSBURGH.—R. M. Trimble, Ferguson building, is preparing plans for the Perry elementary school, to be erected on Perrysville avenue, North Side, to cost about $300,000.

PITTSBURGH.—The Aaron De Roy Motor Co. has awarded D. T. Riffle, Keenan building, a contract for erecting a 4-story garage, 60 x 135 feet, to cost about $85,000.

SHARON, PA.—The Petroleum Iron Works Co. has awarded a contract for 120 x 150-foot addition to its plant to the Fort Pitt Co., Pittsburgh.

YORK, PA.—The York Wagon & Gear Co. has let contract for erection of 1-story addition.

YORK, PA.—The Bell Motor Car Co., H. M. Stanffer, president, has plans in progress for a 1-story, 40 x 108-foot manufacturing building.

Activities in the Central States

CINCINNATI. — The Hobart Mfg. Co., Troy, O., will open a branch factory in this city. Five thousand square feet of space has been required at the northwest corner of Canal and Jackson streets. Arrangements will be made to operate the new branch at once. The company manufactures electric coffee machines.

CLEVELAND.—The New York Central railroad has a permit to erect a brick shop 42 x 248 feet on East 152nd street, to cost about $28,000.

CLEVELAND. — Architect H. T. Jeffrey, Union building, is preparing plans for a market house to be erected at East 106th street and St. Clair avenue, at the cost of $200,000. Cold storage equipment will be installed. The owner is the St. Clair Market Co., Leader-News building.

CLEVELAND. — Charles Harbaugh, Atlas Bolt & Screw Co., announces that his company will spend $350,000 for its new factory improvements. In addition to the buildings now under construction a large structure for the manufacture of bolts and screws is to be erected on Ivanhoe road.

DAYTON, O.—The Crown Hardware Mfg. Co. has increased its capital stock from $32,000 to $60,000 to provide for extensions.

DEFIANCE, O.—A high school building 200 x 250 feet, three stories and basement, will be erected by the board of education. The cost will be $200,000.

LEBANON, O.—The village school district plans to build a high school to cost $60,000.

RAVENNA, O.—A filtration plant to cost $125,000 will be built by the city of Ravenna. Working drawings will be completed about Nov. 15. Equipment has not been purchased.

YOUNGSTOWN, O.—The Mahoning Foundry Co. is erecting a 100 x 200-foot warehouse at its Poland avenue works. It will be three stories high and will cost about $30,000.

YOUNGSTOWN, O. — The Automatic Sprinkler Co., New York, will move its engineering force to this city. A building will be erected shortly to accommodate the engineers.

YOUNGSTOWN, O.—The Concrete Sand & Stone Co., recently incorporated for $1,000,000, will erect a factory and equip it for the manufacture of acetylene oxygen gases used for welding rails.

WHEELING, W. VA. — Bids are being taken by Major Jackson, U. S. engineer, for steel lock gates in the Ohio River Dam No. 22, to cost $50,000.

BRAZIL, IND.—A new factory building, to cost $500,000, will be erected by the Clay Products Co. next spring. The company makes paving brick. Plans have not been prepared.

FT. WAYNE, IND.—A small amount of light machine shop equipment will be needed by Don H. Harris, 3230 Webster street, who will build a public garage, 44 x 150 feet.

INDIANAPOLIS.—The Kilo Electric Meter Co. has been incorporated with $40,000 capital to manufacture electric appliances, by C. L. Marshall, G. A. Schaffer and William T. Wann.

MARTINSVILLE, IND. — A power house three stories, 50 x 50 feet, will be erected by the Home Law Sanitarium Co. Equipment has not been purchased.

MONTICELLIO, IND.—The Thread Mills Co., G. E. Stephenson, superintendent, states that it will make improvements to cost about $40,000. Contracts will be awarded by architects Graham, Burnham & Co., Chicago, before the end of the month.

RICHMOND, IND.—Plans are being made for a reinforced concrete bridge 700 feet long, to cost $180,000. John W. Mueller, Richmond, is consulting engineer.

AURORA, ILL.—The Allsteelequip Co. is preparing private plans for a factory building 80 x 300 feet.

CHICAGO.—The Interstate Iron & Steel Co. is buying a small list of machine shop equipment to provide for an enlargement.

CHICAGO.—The Ekman Cutting Die Co. has been incorporated with $2,500 capital by J. C. Tangenberg, A. A. Johnson and Charles P. Molthrop, 60 West Washington street.

CHICAGO.—The Chicago Bell Foundry Co. has been incorporated with $2,500 capital stock by P. L. Stetson, C. W. Taylor and John Roeder.

DUNDEE, ILL.—The city of Dundee plans building a bridge to cost about $30,000.

HAWTHORNE, ILL.—The Western Electric Co. will build a manufacturing plant, consisting of four buildings. Bids are being taken.

PARIS, ILL.—The drill press room of the McGuire-Cummings car shops was damaged by fire to the extent of $100,000.

ROCK ISLAND, ILL.—John A. Murrin, commissioner of waterworks, will receive bids soon on a 3,000,000-gallon pump.

ANN ARBOR, MICH.—The city of Ann Arbor plans to extend its water system at a cost of about $75,000. Manly Osgood is city engineer.

DETROIT.—The Eastern Washtenaw good roads district will receive bids in January for a viaduct costing $45,000. J. J. Cox, Ann Arbor, is engineer.

DETROIT.—The Automobile Crank Shaft Corporation has been incorporated in New York with capital stock of $1,000,000 to manufacture ground crank shafts exclusively, by J. M. Hibbard, E. E. MacCrone and W. C. Roche. It takes over and will continue the business of the Auto Crank Shaft Co. The plant will be added to sufficiently to double the former capacity.

ESCANABA, MICH. — The Chatfield Machine & Foundry Co. is seeking additional equipment for its machine shop, including 5 and 10-horsepower electric motors.

GRAND RAPIDS, MICH. — The National Tire Chain Co. has increased its capital stock from $25,000 to $100,000.

LANSING, MICH. — A foundry addition, 100 x 120 feet, to cost $50,000, will be built by Novo Engine Co. Bids are being taken.

ST. JOSEPH, MICH. — The Automobile Specialties Mfg. Co., Joliet, will build a 2-story factory, 80 x 400 feet.

MILWAUKEE.—The Maynard Steel Foundry Co. will build an addition of brick, 80 x 85 feet.

MILWAUKEE.—The Western Machine Co. has been incorporated with $5,000 capital stock by E. H. Redstrom, B. Beebe and W. E. Bechmann.

MILWAUKEE. — The Car Lighting Improvement Co. has been incorporated with $25,000 capital stock to manufacture a lighting system, by T. H. Spence and others.

MILWAUKEE.—The Interstate Steel Mfg. Co. has been incorporated with $60,000 capital stock by Harry F. Bayley, J. J. Devlin and W. B. Rotter.

MILAN, MO.—The Dodson Automatic Calculator Co. has been incorporated with $19,000 capital stock to manufacture automatic machines, by John Morris, L. P. Butler and A. F. Dodson.

ST. LOUIS.—The Fulton Iron Works is having plans drawn for a steel forge works to cost approximately $500,000.

ST. LOUIS.—The Lincoln Steel & Forge Works is constructing a fabricating shop in St. Louis. Some equipment is needed, including steam hammers.

TRENTON, MO. — The Trenton Gas & Electric Co. will build a 75-mile, 26,000-volt transmission line.

CEDAR RAPIDS, IA.—The Pressel Steel Mfg. Co. is in the market for some equipment, including shears, punches, stamping presses and the like.

DES MOINES, IA.—Bids will be received until Nov. 29 for a bridge over Des Moines river at Grand avenue. K. Kastberg is city engineer.

Don't Let Your Profits Slip through Your Fingers

Ovens that allow an undue *loss* of heat; ovens that do not produce a *uniform* heat or provide *complete combustion*—are allowing many a perfectly good dollar to slip away from your grasp.

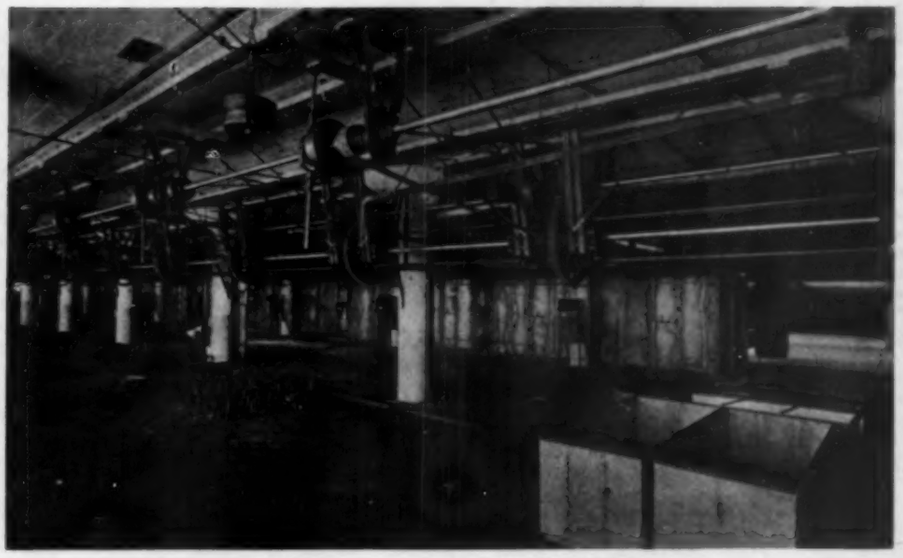
There *are* no such weaknesses in

YOUNG JAPANNING AND DRYING OVENS.

They are most nearly *heat-tight.* Even the joints are insulated against heat leakage.

Young Ovens decrease time, labor and fuel expense. They provide proper ventilation, constant circulation, complete combustion. They insure a uniform heat and greatly facilitate production.

Write at once for details.



Installation in the plant of The Willys-Overland Company

YOUNG BROTHERS COMPANY

Russel and Franklin Streets **Detroit, Michigan**

In the South and Around the Gulf

NORFOLK, VA.—The Atlantic Iron Works has been incorporated with $25,000 capital by F. H. Masi, president, and C. A. Marwitz, treasurer.

ATLANTA, GA.—The Pasco Tool Co. has been incorporated with $10,000 capital, to manufacture tools, by G. G. Pasco and A. R. Brittain.

BIRMINGHAM, ALA.—The Morrison Frogless Switch Co. has been incorporated with $100,000 capital, by I. D. Davis, J. C. Morrison, W. G. Patterson and H. G. Kelley.

BIRMINGHAM, ALA.—The plant of the Birmingham Machine & Foundry Co. was damaged by fire to the extent of $20,000. A large amount of the damaged machinery will have to be replaced.

CHATTANOOGA, TENN. — The Chattanooga Mfg. Co. has been incorporated by Charles Reif, S. T. Lewis and others with $50,000 capital.

KNOXVILLE, TENN.—The John G. Duncan Co. is asking for dealers' prices, quick delivery, on 40, 50 and 60 horsepower locomotives or Scotch marine boilers, second hand.

KNOXVILLE, TENN.—The city has approved the proposed $250,000 bond issue for improvement of the municipal water system. R. C. Anderson, Cincinnati, is preparing plans, which will include a vertical pump, 15,000,000 gallon capacity.

MEMPHIS, TENN.—The city commission of Memphis will ask the legislature to authorize a vote on an additional $1,500,000 of bonds for the municipal light and power plant, for which a similar issue will be sold Nov. 14. F. W. Ballard, Cleveland, estimates the cost of the new plant, which is to be built on the Mississippi river, at $2,980,150, divided as follows: Generating station, $292,000; substation, garages, etc., $150,000; overhead transmission and distribution, $120,000; underground transmission and distribution, $725,000; miscellaneous construction, $277,150; materials and supplies, $150,000; working capital $40,000; organization expenses, $20,000.

LEXINGTON, KY.—The American Metallic Packing Co., Lexington, Ky., is asking for

Here's Your Chance

The Chicago, Milwaukee & St. Paul railroad, John T. Crocker, Railway Exchange building, Chicago, purchasing agent, wants the following equipment:

One 36-inch engine lathe.
One 24-inch upright drill press.
One 36 x 36 x 10-foot table planer.
One band saw, 48-inch wheel.
Two emery wheel grinders.
One vertical hollow chisel mortiser.
One 18-inch engine lathe.
One 34-inch upright drill press.
One hand feed rip saw.
One endless bed surfacer.
One wall bracket cutting off saw.
All machines to be belt driven.

a 500-horsepower steam turbine, direct connected to generator, in first class condition and for three return tubular boilers, 72-inch x 18-foot with working pressure of 150 pounds.

LOUISVILLE, KY. — Eleven alternating current motors, 5 to 40 horsepower, will be installed by the Brinly-Hardy Co., plow manufacturer. Changes in heating plant, etc., will cost about $3,500.

LOUISVILLE, KY.—The Roy C. Whayne Supply Co. is in the market for a 2 or 2½-yard revolving shovel, steam or electric.

LOUISVILLE, KY.—Thomas L. Barret, is in the market for a locomotive crane, new or second hand, to handle a 2-yard grab bucket at a 60-foot radius.

LOUISVILLE, KY.—Addition of a foundry department to its factory is being considered by the James Clark Jr., Co., manufacturers of motors, tools, etc.

OWENSBORO, KY.—The Simplex Farm Ditcher Co. has been incorporated with $250,000 capital and has leased a plant to manufacture ditching machines. Incorporators include Joseph Wile, G. Taylor Herr, J. R. Kinder and others.

PICAYUNE, LA.—The Stern Foundry & Machine Co. will make additions to its plant at 1630 Annunciation street which will cost approximately $100,000. N. S. Stern, president, states that the improvements will include a foundry building and machine shop.

FLORENCE, TEX.—The board of supervisors are planning to build a 6-span bridge over the Gila river at a cost of $65,000.

GAINSVILLE, TEX.—The Whaley, Nichols & Scott Mfg. Co. has been organized with $100,000 capital and will build a factory to manufacture farm devices.

SHERMAN, TEX.—The Washington Iron Works has been incorporated with $30,000 capital by J. M. Totten, H. L. Totten, and Solon Totten.

CLAIREMORE, OKLA.—The county commissioners have approved plans for a $21,000 steel bridge.

New Business in Eastern Canada

GRAND RAPIDS, MAN. — The Manitoba Pulp & Paper Co., Winnipeg, Man., proposes to construct a power plant at Grand Rapids. The company is also making preparations for the erection of large pulp and paper mills.

LONDON, MAN. — The British America Nickel Co. is making arrangements for a site for the erection of a large refining plant, and has secured E. P. Matcheson as manager of the company. E. R. Wood and James P. Dunn, both of London, Ont., are interested in the company.

CALABOGIE, ONT. — Power development works have been commenced by M. J. O'Brien of Renfrew. Dams will be built at the foot of Lake Calabogie and a 5,000-horsepower capacity power house will be erected at a cost approximating $500,000.

FERGUS, ONT.—Beatty Bros. are making extensive additions to their plant. A new building is being erected on Hill street in which the iron working machinery at the Grand River plant will be installed. A 3-story addition is also being erected to the Grand River plant and new wood-working machinery will be installed.

PORT WILLIAM, ONT. — M. Sellers & Son will build an elevator with a capacity of 500,000 bushels to cost about $130,000. Tenders will be called for immediately for constructing working house with a capacity of 100,000 bushels. Concrete tanks to hold 400,000 bushels more will be built in the spring.

GALT, ONT.—The Perfect Machinery Co. has commenced the erection of a molding shop to be operated in connection with the plant recently erected at Galt by the company. The addition will be L-shape 60 x 24-foot and 20 x 26 feet and will be constructed of brick and concrete. All castings which were formerly purchased by the company will be turned out in the new plant.

HAMILTON, ONT.—Plans for the new office building of the Canadian Westinghouse Co. to be connected by a bridge with the main plant are being prepared by Prack & Perrin, of Toronto. It will be 75 x 200 feet, five stories high of brick, stone and terra cotta and will cost about $150,000.

LEAMINGTON, ONT.—John A. Campbell is in the market for a gas engine, 50 to 100-horsepower.

PORT ARTHUR, ONT.—The Fegles-Bellows Engineering Co. will erect a plant for doing structural work and repairing equipment for their general contracting business.

PORT ARTHUR, ONT.—The citizens of Port Arthur, Oct. 23, ratified an agreement with A. G. McIntyre, of Toronto, representing large pulp mill interests under which a pulp mill with a capacity of 150 tons per day to cost $1,000,000 will be built on a 100-acre site given by the city.

RENFREW, ONT.—The Provincial Hydro-Electric commission will proceed with the construction of a storage dam at Golden Lake to generate power for Renfrew as soon as a contract with the municipality has been signed.

STRATFORD, ONT. — The Reliners Co. has been incorporated to manufacture automobiles and accessories with $200,000 capital. The provisional directors are Wm. H. Adams, Wm. T. Folliott, Charles Davis and others of Toronto.

TILLSONBURG, ONT.—The Tillsonburg Foundry & Machine Co. has been incorporated with $25,000 capital to manufacture machinery, motors, engines, iron, steel, tractors, etc., by Sydney E. Dykeman, David J. Downs, Frederick J. Bushnell and others of Tillsonburg.

TORONTO.—The Reliance Motor & Tool Co. has been incorporated to manufacture tools, machinery and motor appliances with $60,000 capital by Willis B. Sturrup, John S. Duggan and C. A. St. C. McKay, of Toronto.

TORONTO.—The Pressed Metals Co. has been incorporated to manufacture iron, steel, metals, machinery, tools, etc., with $60,000 capital by John W. Leighton, 67 Walker avenue; Owen J. P. Crick, 33 Southview

avenue, James H. Chewett, and others of Toronto.

TORONTO.—The Dictating Machine Co. has been incorporated to manufacture all kinds of receiving, reproducing and transcribing machines with $40,000 capital. The provisional directors are William E. Movie, et al.

TORONTO.—The White Co. has been incorporated with $40,000 capital to manufacture automobiles, accessories, tools, etc., by Wilfrid M. Cox, 803 Dominion Bank building; Howard A. Harrison, 45 West King street; William J. Beattie, and others of Toronto.

WALKERVILLE, ONT. — The Universal Button Fastening & Button Co. has been incorporated to manufacture buttons and button fasteners, with $20,000 capital by John M. Longyear, H. W. Longyear and Ernest T. Tappey of Detroit.

MONTREAL.—The Machine Builders Co. has been incorporated to manufacture metals, machinery and munitions with $50,000 capital, by John W. Cook, Theodore B. Heney and Henry R. Malvena, of Montreal.

MONTREAL. — The Continental Construction Co. has been incorporated as ship builder and manufacturer of engines and machinery with $10,000 capital, by Leopold Choquette, George E. Chart and Lorne C. Herdman, of Montreal.

MONTREAL.—The E. J. Silley Co. has been incorporated to carry on business as roofer, contractor and manufacturer of roofing and building material with $50,000 capital, by Edwin J. Sibley, James D. Hutchinson, Richard B. Proctor and others of Montreal.

MONTREAL.—A. R. Whitall Can Co. has been incorporated to manufacture cans and containers and metal kitchen and household wares with $500,000 capital; by Albert R. Whitall, Fred R. Whitall and Michael A. Phelan, of West Mount.

MONTREAL. — La Campagnie de Pneus Roger Co. has been incorporated to manufacture automobiles, engines and conveyances with $250,000 capital; by Wilfrid J. G. Roger, Telesphore Leduc and Charles R. LaSalle, of Montreal.

NEW GLASGOW, N. S.—The Steel Furnishing Co. is in the market for three turret lathes, for steel sockets; also three millers suitable for milling outside thread of sockets.

New Trade Publications

FORGING MACHINES. — The National Machinery Co., Tiffin, O., has issued a circular showing how a typical railroad forging may be made on a forging machine. The dies required for forming hand holds or grab irons for railroad cars are illustrated and the various operations in upsetting the ends of the steel stock to form the feet, punching the holes for the rivets, and forming the completed grab iron, are outlined.

ELECTRIC CRANES.—A four-page folder containing views of the new engineering laboratories of the Massachusetts Institute of Technology has been issued by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. The illustrations show the exterior of the new building and a view of the hydraulic and steam and electrical laboratories which are served by three-motor cage-controled electric traveling cranes of 10 tons capacity. One page of the folder is devoted to data regarding typical crane trolleys.

FUEL OIL APPLIANCES.—Oil-fired industrial furnaces, and burners, burner plates, oil pumps and other auxiliaries are described in a 28-page booklet published by the W. S. Rockwell Co., 50 Church street, New York. The use of oil furnaces in brass and copper rolling mills, and for carbonizing, heat-treating, and spring making is discussed. Several pages are devoted to descriptions of the fittings which accompany a furnace installation and a considerable portion of the booklet contains illustrations and descriptive matter pertaining to steam and motor driven fuel oil pumping systems. Unloading hose, pressure tanks, tell-tales and ventilators, strainers, regulating valves, gages and other details of fuel oil storage equipment are illustrated and described.

UNIVERSAL FLUE WELDER. — The Southwark Foundry & Machine Co., Philadelphia, has issued a bulletin describing its universal flue welder. This machine is designed to meet the requirements of the average railroad shop where repairs are made on locomotive superheaters. A special device on this machine allows work to be done on the inside of the tube instead of on the outside. This method of operation is said to possess unusual advantages. While working on the machine the operator stands some distance from the furnace, a foot valve controling the entire operation of the welder. The mandrel is motor driven and is started by an air chuck automatically operated with the clamping of the flue. It is stated by the manufacturer that an ordinary welding crew can handle 120 superheater flues in 10 hours.

SELF-OILING ENGINES.—"Vertical Self-oiling Engines" is the subject of a 16-page catalog published by Engberg's Electric & Mechanical Works, St. Joseph, Mich. The details of these engines are carefully described and illustrated, and sectional views of the complete engine are shown. The piston, cast hollow to reduce the weight, is riveted on the piston rod. The automatic governor is said to control the speed within 2 per cent from no load to full load. Removable side doors are provided on each side of the engine frame, allowing access to the cross-head, wrist pin and all adjacent parts, while the hand hole pieces on the opposite side of the engine frame give access to the lower end of the connecting rod. A part of the catalog is devoted to a table showing the rated horsepower of various sizes of engines. Tables of specifications and dimensions are also presented.

STEAM ENGINES AND BOILERS.—A 40-page catalog describing single and compound steam engines and stationary and portable boilers has been issued by the Erie City Iron Works, Erie, Pa. Single cylinder and compound poppet-valve engines, invented and developed by Hugo Lentz, foot-valve engines of the enclosed and open bed type, medium speed side-crank automatic engines and various kinds of throttling engines are illustrated. The specifications of these power units are presented in tabular form and are accompanied by brief descriptions. Part of the catalog is devoted to horizontal and vertical boilers ranging in size from 20 to 250 horsepower and designed for pressures of 100, 125 and 150 pounds per square inch. A number of horizontal return tubular boilers and water and open-bottom portable boilers are also mentioned. The last few pages of the catalog contain data regarding several types of feed water heaters.

CONTROL DEVICES.—The advent of electrical equipment in steel mills has called for the production of special control apparatus to meet the severe demands imposed upon electrical machinery in this industry. The Cutler-Hammer Mfg. Co., Milwaukee, has designed a number of automatic and manual control devices for this class of work which are described in an illustrated booklet recently distributed by the company. The application of various kinds of control apparatus to tilting tables, cranes, screw-down drives, furnace chargers and similar machines to be found in iron and steel plants, is outlined. The devices described include magnetic control panels, time-limit and current-limit control switches, and a number of hand-operated controllers for both alternating and direct current. In addition to these, the pamphlet presents a brief description of magnetic separators and brakes and lifting magnets. Technical data of value to buyers of this class of equipment accompany the descriptions.

STEEL PLATE CONSTRUCTION.—An attractive 48-page catalog in two colors, published by the Struthers-Wells Co., Warren, Pa., interestingly presents the history of that company from 1851, the date of its founding, to the present time. The details of the organization are disclosed, showing that every department head is a member of the company and an owner of a substantial block of fully paid stock. The products of the plant, including rectangular, round and oval tanks, stacks, boilers, kettles, stills, condensers, flumes, penstocks, riveted and welded pipe, are described and illustrated throughout the catalog. Of particular interest in this connection is an account of the construction of the first penstock at Niagara Falls in 1897. This tube is 11 feet in diameter and 440 feet long. Sixteen of these penstocks have since been erected on the American side of the river near the falls. Under the heading, "A Trip Through the Plant," is a description of the various departments, accompanied by views of the interior of the departments.

PISTON RINGS.—The 1916 edition of the piston ring directory published by the Burd High Compression Ring Co., Rockford, Ill., contains 180 pages devoted to a description of piston rings, a discussion of automobile cylinder troubles, and a complete list of the number and size of rings used in the cylinders of automobile and other internal combustion engines. It is shown, in a brief review of the development of the gasoline engine, that for over 40 years the common split piston ring has been favored by engineers for the reason that it safely served its purpose, although it had a tendency to leak. The ring described in the catalog is essentially a ring of the old type, with the exception that a patented segment which covers the joint, offers protection at the point where in old style rings the exploded gases often leaked through. The rings are cast separately from a gray iron of special analysis, which is filtered during the process of pouring to insure the elimination of all impurities. Decimal equivalents of fractions, conversion tables of millimeters to inches, and horsepower formulas are given in the last few pages of the directory.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1, 1917; higher to Jan. 1, 1918.)

Bessemer valley	$30.00
Bessemer, Pittsburgh	30.95
Basic, Pittsburgh	24.95 to 25.95
Basic, eastern Pa.	26.00
Basic, Buffalo	25.00 to 26.00
Malleable, Pittsburgh	26.95
Malleable foundry, Chicago	25.00 to 26.00
Malleable foundry, Philadelphia	28.00 to 28.50
Malleable foundry, Buffalo	25.00 to 26.00
No. 1X foundry, Philadelphia	26.00 to 26.50
No. 2 foundry, Pittsburgh	26.95
No. 2 foundry, Cleveland	25.00 to 26.00
No. 2 foundry, Ironton	23.00 to 25.00
No. 2 foundry, Chicago	25.00 to 26.00
No. 2X foundry, Philadelphia	25.00 to 26.00
No. 2X foundry, N. J. tidewater	25.00 to 26.00
No. 2X foundry, Buffalo	25.00 to 26.00
No. 2 plain, Philadelphia	24.50 to 25.00
No. 2 plain, N. J. tidewater	24.50 to 25.00
No. 2 plain, Buffalo	25.00 to 26.00
No. 2 southern, Birmingham	20.00
No. 2 southern, Cleveland	24.00
No. 2 southern, Chicago	24.00
No. 2 southern, Phila. delivery	24.50 to 25.00
No. 2 southern, Cleveland	23.00 to 24.00
No. 2 southern, New York docks	24.25 to 24.75
No. 2 southern, Boston docks	24.50 to 25.00
No. 2 south. interior, New Eng.	25.00 to 26.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	24.00 to 25.00
Virginia, No. 2X, Philadelphia	26.75 to 27.75
Virginia, No. 2X, Jersey City	27.00 to 28.00
Virginia 2X, Boston points	27.25 to 28.25
Gray forge, eastern Pa.	23.00 to 24.00
Gray forge, Pittsburgh	25.95
Gray forge, Birmingham	18.00
Silveries, 8 per cent, furnace	30.00
Silveries, 8 per cent, Chicago	29.50 to 30.50
Low phos. Standard, Phila.	45.00
Low phos. Lebanon, Pa., furnace	38.00 to 39.00
Low phos., Pittsburgh	40.00 to 41.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	20.75 to 22.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	22.50 to 23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit	8.5c to 8.9c
Local N. Y. and N. J. ores, unit	9.0c to9.50c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.
(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	nominal
For'n non-Bess., 50 to 65 per cent	nominal

COKE

(At the ovens.)

Connellsville furnace	$7.50 to 8.00
Connellsville fur., contract	3.75 to 4.00
Connellsville foundry, contract	5.00 to 6.50
Connellsville foundry	8.00 to 8.25
Wise county furnace, contract	4.50 to 5.00
Wise county foundry, contract	5.00 to 6.00
Pocahontas foundry, contract	5.00 to 6.00
Pocahontas furnace, contract	4.50 to 5.00
New River foundry, contract	5.50 to 6.00
New River furnace, contract	5.00 to 5.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, or delivered prompt	$160 to 165
Ferro manganese, 80 per cent, seaboard, or delivered, contract	160 to 165
Spiegel, 20 per cent, fur. early and last half	45.00 to 50.00
Ferro-silicon, 50 per cent, Pbg.	95.00 to 100.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $34.00; 10 to 11 per cent, $35.00; 11 to 12 per cent, $36.00; 12 to 13 per cent, $37.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$50.00 to 55.00
Forging billets, Phila.	65.00 to 70.00
Forging billets, Pbgh., nominal	70.00 to 80.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh (nom.)	65.00
Bessemer billets, Youngstown	50.00 to 55.00
Bessemer billets, Pittsburgh	50.00 to 55.00
Open hearth billets, Pittsburgh	50.00 to 55.00
Open hearth billets, Youngstown	50.00 to 55.00
Bess. sheet bars, Youngstown	50.00 to 55.00
Op. h'th sheet bars, Youngstown	50.00 to 55.00
Bess. sheet bars, Pittsburgh	50.00 to 55.00
Open hearth sheet bars, Pbgh	50.00 to 55.00
Muck bars, Pittsburgh (nominal)	50.00

SKELP

Grooved steel skelp	2.70c to 2.80c
Sheared steel skelp	3.00c to 3.25c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bess. rails, Pbgh & Chgo.	$33.00
Stan. op-h'th rails, Pbg & Chgo.	35.00
Light rails 8 to 10 lbs., Pbgh	45.00
Light rails, 8 lb., Chicago	43.00
Light rails, 12 to 14 lbs., Pbgh	44.00
Light rails, 12 lbs., Chicago	42.00
Light rails, 16 to 20 lbs., Pbgh	43.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Chgo.	$41.00
Light rails, 25 to 45 lbs., Pbgh.	42.00
Light rails, 25 to 45 lbs., Chgo.	40.00
Relaying rails, standard, Pbgh. and Chicago	$23.00 to 24.00
Relaying rails light, Chicago	24.00 to 25.00
Angle bars, st. sect., Pbgh. base	2.00c to 2.50c
Angle bars, st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	2.65c to 2.75c
Spikes, railroad, Chicago	2.75c to 2.90c
Track bolts, Pittsburgh	4.25c to 4.75c
Track bolts, Chicago	4.25c to 4.50c
Tie plates, Chicago	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	2.80c
Structural shapes, Pbgh.	2.85c to 3.00c
Structural shapes, Philadelphia	2.959c to 3.159c
Structural shapes, Chgo.	2.99c to 3.44c
Structural shapes, New York	2.969c to 3.169c
Tank plates, Chgo.	3.44c to 3.69c
Tank plates, Pittsburgh (con.)	3.25c to 3.50c
Tank plates, Pbgh.	3.50c to 4.00c
Tank plates, Philadelphia	3.659c to 4.159c
Tank plates, New York	3.669c to 4.169c
Bars, soft steel, Chicago	2.89c to 3.50c
Bars, soft steel, Pbgh. (con.)	2.70c to 2.80c
Bars, soft steel, Pbgh.	2.85c to 3.00c
Bars, soft steel, New York	2.869c to 3.019c
Bars, soft steel, Philadelphia	2.859c to 3.009c
Hoops, carloads, Pittsburgh	3.25c
Bands, Pittsburgh	2.70c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chgo.	2.45c to 2.50c
Bar iron, Philadelphia	2.559c to 2.659c
Bar iron, Cleveland	2.60c to 2.70c
Bar iron, New York	2.569c to 2.669c
Bar iron, Pittsburgh	2.65c to 2.75c
Hard Bess. steel bars, Chgo.	2.50c to 2.60c

SHEETS

(In cents per pound.)
(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	3.45
22 to 24	3.50
25 and 26	3.55
27	3.60
28	3.65
29	3.70
30	3.80

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	3.45
17 to 21	3.50
22 to 24	3.55
25 to 27	3.60
28	3.65
29 and 30	3.70
30½ and 31	3.75

GALVANIZED.

Gage.	Bessemer.
10 and 11	4.00 to 4.50
12 to 14	4.10 to 4.60
15 and 16	4.25 to 4.75
17 to 21	4.40 to 4.90
22 to 24	4.55 to 5.05
25 and 26	4.70 to 5.20
27	4.85 to 5.35
28	5.00 to 5.50
29	5.20 to 5.70
30	5.40 to 5.90

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	3.50
9 to 10	3.25
11 to 12	3.25
13 and 14	3.35
15 and 16	3.40

No. 28, black, Chicago	3.94c
No. 28 galvanized, Chicago	5.19c
No. 10 blue annealed, Phila.	3.419c
No. 10, blue annealed, Chgo.	3.69c to 3.94c

TIN PLATE

Tin plate, 100 lb., coke base	6.00c to 6.50c
Terne plate	4.90c

IRON AND STEEL PIPE

(Prices adopted Nov. 1, 1916.)

Steel.

Butt weld:—	Black.	Galv.
⅛, ¼ and ⅜ in.	62	35½
½ in.	66	51½
¾ to 3 in.	69	55½
Lap weld:—		
2 in.	62	49½
2½ to 6 in.	65	52½
7 to 12 in.	62	48½
13 and 14 in.	52½	....
15 in.	50	....

Iron.

Butt weld:—	Black.	Galv.
⅛ and ¼ in.	51	24
⅜ in.	52	25
½ in.	56	38
¾ to 1½ in.	59	43
Lap weld:—		
1¼ in.	45	30
1½ in.	51	37
2 in.	52	38
2½ to 6 in.	54	41
7 to 12 in.	53	40

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	52
Iron, 3½ to 4½ inches, l. c. l.	42

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Nov. 6, 1916.)
(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.85
Plain wire, jobbers', Pittsburgh	2.80
Galvanized wire, jobbers', Pbgh	3.50
Polished staples, Pbgh	3.00
Galvanized staples, Pbgh	3.70
Barb wire, painted, jobbers', Pbgh.	3.00
Barb wire, galv., jobbers', Pbgh	3.70

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 50 and 5, cut threads, 40, 10 and 2½, larger or longer, 35 and 2½.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 50, and 10; cut, 50; larger or longer, 40 and 5.

Cold pressed, semi-finished hexagon nuts, 60 and 5.

Gimlet and cone point lag bolts, 50 and 10. Hot pressed square, blank or tapped nuts, $2.70 off list; hot pressed hexagon blank or tapped, $2.70.

Cold pressed square, blank or tapped, $2.40 off; hexagon, blank or tapped, all sizes, $2.80.

RIVETS

Structural rivets, Pbgh	4.00c
Structural rivets, Chgo. delivery	4.25c
Boiler rivets, Pbgh	4.10c
Boiler rivets, Chgo. delivery	4.35c
Tinner's rivets, 45, 10 and 5 off, Pittsburgh.	

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.70c to 2.80c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c to 5.50c

COLD ROLLED STRIP STEEL

Base price 6.50c to 7.00c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$38.00 to 39.00
Six-inch and larger, Chicago	35.00 to 36.00
Six-inch Class B, New York	32.50
Four-inch Class B, New York	35.50
Four and six-inch Birmingham	33.00 to 34.00
Six-inch and larger, Birmingham	30.00 to 31.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.35c
Steel squares, 2-in. & ov., Cleve.	4.00c
Steel rounds, 2-in. & ov., Cleve.	4.00c
Steel bars, und. 2 in., Cleveland	3.50c
Steel bars, Detroit	3.35c
Steel bars, Philadelphia	3.40c to 3.50c
Steel bars, New York	3.50c
Steel bars, St. Louis	3.40c
Steel bars, Cincinnati	3.45c to 4.00c
Steel bars, St. Paul	3.45c
Steel bars, over 2-in., Buffalo	4.20c
Steel bars, Buffalo	3.50c
Iron bars, Chicago	3.35c
Iron bars, Cleveland	3.35c
Iron bars, Detroit	3.35c
Iron bars, St. Louis	3.30c to 3.35c
Iron bars, Cincinnati	3.45c to 4.00c
Iron bars, Philadelphia	3.25c
Iron bars, New York	3.50c
Shapes, Chicago	3.35c
Shapes, Detroit	3.45c
Shapes, St. Louis	3.40c
Shapes, St. Paul	3.45c
Shapes, New York	3.50c
Shapes, Cleveland	3.60c
Shapes, Philadelphia	3.40c to 3.50c
Shapes, Buffalo	3.60c
Shapes and plates, Cincinnati	3.50c to 3.90c
Plates, Chicago	4.00c
Plates, Detroit	4.00c
Plates, St. Louis	4.05c
Plates, St. Paul	4.10c
Plates, New York, wide	4.75c
Plates, New York, narrow	4.50c
Plates, Cleveland	4.10c
Plates, Philadelphia	4.25c to 4.75c
No. 10 blue anl. sheets, Chicago	3.80c
No. 10 blue anl. sheets, Cleve.	3.75c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. L.	3.85c
No. 10 blue anl. sheets, Cinci.	3.90c
No. 10 blue anl. sheets, St. Paul	4.00c
No. 10 blue anl. sheets, Detroit	3.75c
No. 28 black sheets, Chicago	4.10c
No. 28 black sheets, Cleveland	3.90c
No. 28 black sheets, Cincinnati	3.90c
No. 28 black sheets, Detroit	3.90c
No. 28 black sheets, St. Louis	4.15c
No. 28 black sheets, St. Paul	4.40c
No. 28 galv. sheets, Chicago	5.40c
No. 28 galv. sheets, Cleveland	5.50c
No. 28 galv. sheets, Cincinnati	5.25c
No. 28 galv. sheets, Detroit	5.50c
No. 28 galv. sheets, St. Louis	5.75c to 5.95c
Hoops, Cleveland	4.25c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$25.00 to 26.00
Angle bars, steel, St. Louis	19.50 to 20.00
Arch bars and transoms, Chgo.	27.50 to 28.00
Arch bars and transoms, St. L.	25.00 to 26.00
Boiler plate, cut, No. 1, Chgo.	10.50 to 11.00
Boiler plate, cut, No. 1, St. L.	13.50 to 14.00
Boiler punchings, Chicago	17.00 to 18.00
Bundled sheet, Cincinnati	9.25 to 9.75
Busheling, No. 1, Chicago	17.25 to 17.50
Busheling, No. 1, Cincinnati	13.25 to 13.75
Busheling, No. 1, Cleveland	17.00 to 17.25
Busheling, No. 1, St. Louis	16.25 to 16.75
Busheling, No. 2, Chicago	11.00 to 11.50
Cast borings, Chicago	7.75 to 8.25
Cast borings, Cincinnati	5.00 to 5.50
Cast borings, Cleveland	7.25 to 7.50
Cast borings, St. Louis	6.50 to 7.00
Cast, No. 1, Chicago	15.50 to 16.00
Cast, No. 1, Cincinnati	13.00 to 13.50
Cast, No. 1, Cleveland	16.00 to 16.50
Cast, No. 1, St. Louis	14.00 to 15.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	20.00 to 20.50
Iron axles, St. Louis	33.50 to 34.00
Iron axles, Cleve.	38.00 to 39.00
Knuckles, coup., Chicago	20.50 to 21.00
Knuckles, coup., St. Louis	19.00 to 20.00
Locomotive tires, Chicago	26.50 to 27.00
Locomotive tires, St. Louis	23.50 to 24.00
Machine shop turnings, Chgo.	7.25 to 7.75
Machine shop turnings, Cleve.	6.25 to 6.50
Machine shop turn'gs, Cincinnati	5.50 to 6.00
Machine shop turnings, St. L.	6.25 to 6.50
Malleable agricultural, Chgo.	13.00 to 13.50
Malleable agricultural, St. Louis	14.00 to 14.50
Malleable, Cincinnati	9.25 to 9.75
Malleable railroad, Chicago	16.00 to 16.50
Malleable railroad, St. Louis	14.00 to 14.50
Pipes and flues, Cleveland	13.50 to 13.75
Pipes and flues, Chgo.	15.00 to 15.50
Pipes and flues, St. Louis	14.50 to 15.00
Railroad wrought, No. 1, Chgo.	21.00 to 21.50
Railroad wrought, No. 1, Cleve.	20.00 to 21.00
Railroad wrought, No. 1, St. L.	19.50 to 20.00
Railroad wrought, No. 1, Cinci.	15.50 to 16.00
Railroad wrought, No. 2, Chgo.	$20.00 to 20.50
Railroad wrought, No. 2, St. L.	18.50 to 19.00
Shafting, St. Louis	24.00 to 25.00
Springs, Chicago	20.50 to 21.00
Steel car axles, St. Louis	37.00 to 38.00
Steel car axles, Chicago	37.00 to 38.00
Stove plate, Chicago	11.25 to 11.75
Stove plate, Cleveland	12.50 to 13.00
Stove plate, Cincinnati	8.75 to 9.25
Stove plates, St. Louis	13.00 to 13.50

(Gross tons.)

Axle turnings, Cleveland	$13.00 to 13.25
Busheling, No. 1, Buffalo	16.00 to 16.50
Busheling, No. 1, Pittsburgh	14.75 to 15.25
Busheling, No. 2, Buffalo	12.50 to 13.00
Bundled sheets, Pittsburgh	13.00 to 13.25
Bundled sheets, Cleveland	11.50 to 12.00
Bundled sheets, Buffalo	13.50 to 14.00
Car wheels, (iron), Pittsburgh	16.00 to 17.00
Car wheels (steel), Pittsburgh	19.00 to 19.50
Car wheels, Chicago	15.50 to 16.00
Car wheels, eastern Pa	18.00 to 18.50
Car wheels, Buffalo	17.00 to 18.00
Car wheels, New York	16.00 to 16.50
Car wheels, St. Louis	16.00 to 16.50
Car wheels, Birmingham	12.50 to 13.00
Tram car wheels, B'ham	9.50 to 10.00
Cast borings, New York	8.50 to 9.00
Cast borings, eastern Pa	11.00 to 11.50
Cast borings, Buffalo	9.50 to 10.00
Cast borings, Pittsburgh	9.00 to 9.25
Cast, No. 1, eastern Pa	17.50 to 18.00
Cast, No. 1, Pittsburgh	16.00 to 16.50
Cast, No. 1, Birmingham	12.50 to 13.00
Cast, heavy No. 1, N. J. points	16.00 to 16.50
Forge, No. 1, eastern Pa	13.50 to 14.00
Frogs, switches, guards, St. L.	19.50 to 20.00
Grate bars, Buffalo	14.00 to 14.50
Grate bars, N. J. points	12.00 to 12.25
Heavy axle turnings, Buffalo	12.00
Heavy melting steel, Pittsburgh	19.50 to 20.50
Heavy melting steel, Buffalo	19.25 to 20.00
Heavy melting steel, Chicago	19.25 to 19.75
Heavy melting steel, Cleveland	19.25 to 19.75
Heavy melting steel, Cincinnati	17.25 to 17.75
Heavy melting steel, eastern Pa.	19.50 to 20.00
Heavy melting steel, New York	17.50 to 18.00
Heavy melting steel, St. L.	20.50 to 21.00
Heavy melting steel, B'ham	12.50 to 13.00
Iron rails, Chicago	25.00 to 25.50
Iron rails, Buffalo	20.50 to 21.00
Iron rails, Cincinnati	19.50 to 20.00
Iron rails, St. Louis	23.00 to 23.50
Iron rails, Cleveland	24.00
Iron axles, Pittsburgh	38.00 to 40.00
Iron axles, Cincinnati	25.00 to 25.50
Iron axles, eastern Pa	35.00 to 36.00
Iron axles, Chicago	38.00 to 40.00
Iron axles, Buffalo	35.00
Low phos. steel, Buffalo	24.00 to 25.00
Low phos. steel, Pittsburgh	22.00 to 23.00
Low phos. steel, eastern Pa.	27.00 to 28.00
Machine shop turnings, Buffalo	8.50 to 9.00
Mch. shop turnings, New York	8.00 to 8.50
Mch. shop turnings, Pittsburgh	8.50 to 9.00
Mch. shop turnings, eastern Pa.	10.00 to 10.50
Mch. shop turnings, Birmingham	6.50 to 7.00
Malleable railroad, Cleveland	19.00 to 19.25
Malleable railroad, Buffalo	18.00 to 18.50
Malleable railroad, Pittsburgh	16.50 to 16.75
Malleable railroad, eastern Pa.	15.50 to 16.00
R. R. and mch. cast, No. 1 Bfl.	19.00 to 20.00
R. R. wrought, No. 1, Buffalo	21.50 to 22.25
R. R. wrgt., No. 1, eastern Pa.	23.50 to 24.00
City wrought, New York	15.00 to 15.50
R. R. wrought, No. 1, Pbgh.	20.00 to 21.00
R. R. wrought, No. 1, B'ham	13.00 to 13.50
Reroll. rails, 5 ft. and ov., Pbg.	20.25 to 21.25
Reroll. rails, 5 ft. & ov., Chgo.	25.50 to 26.00
Reroll. rails, 5 ft. & ov., E. Pa.	23.00 to 24.00
Reroll. rails, 5 ft. & ov., St. L.	21.50 to 22.00
Shafting, New York	21.00 to 21.50
Shafting, eastern Pa	23.00 to 23.50
Shoveling steel, Chicago	17.50 to 18.00
Shoveling steel, St. Louis	19.00 to 19.50
Steel rails, short, Chicago	22.00 to 24.00
Steel rails, short, Cleveland	23.00 to 23.25
Steel rails, over 6 ft. Cleveland	19.50 to 20.50
Steel rails, old, B'ham	12.50 to 13.00
Steel rails, short, St. Louis	21.00 to 21.50
Steel car axles, Birmingham	26.00 to 27.00
Steel car axles, New York	35.00 to 36.00
Steel car axles, Buffalo	35.00
Steel car axles, Cleveland	41.00 to 42.00
Steel car axles, Pittsburgh	38.00 to 40.00
Steel car axles, eastern Pa	35.00 to 36.00
Stove plate, N. J. points	12.25 to 12.75
Stove plate, Birmingham	9.75 to 10.00
Stove plate, Pittsburgh	12.00 to 12.50
Stove plate, eastern Pa	14.00 to 14.50
Stove plate, Buffalo	14.25 to 14.75
Wrought pipe, New York	15.00 to 15.50
Wrought pipe, eastern Pa	17.00 to 17.50
Wrought pipe, Buffalo	14.50 to 15.00

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ANTIMONY OXIDES.
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BANDS.
(Steel.)
Carnegie Steel Co., Pittsburgh, Pa.

BARGES.
(Steel.)
American Bridge Co., New York City.

BARRELS, TUMBLING.
(Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARS—ALLOY.
Central Steel Co., The, Massillon, O.

BARS.
(Concrete Reinforcing.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS.
(Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

BEAMS, CHANNELS AND ANGLES.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS.
(Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS.
(Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING.
(Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING.
(Chain.)
Link-Belt Company, Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BENCHES.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES.
(Drawing.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL, RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BESSEMER SQUARES.
(Soft.)
Witherow Steel Co., Pittsburgh, Pa.

BILLETS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BINS.
(Steel.)
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE TUYERES.
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS.
(Chain.)
Yale & Towne Mfg. Co., New York City.

BLOOMS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

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